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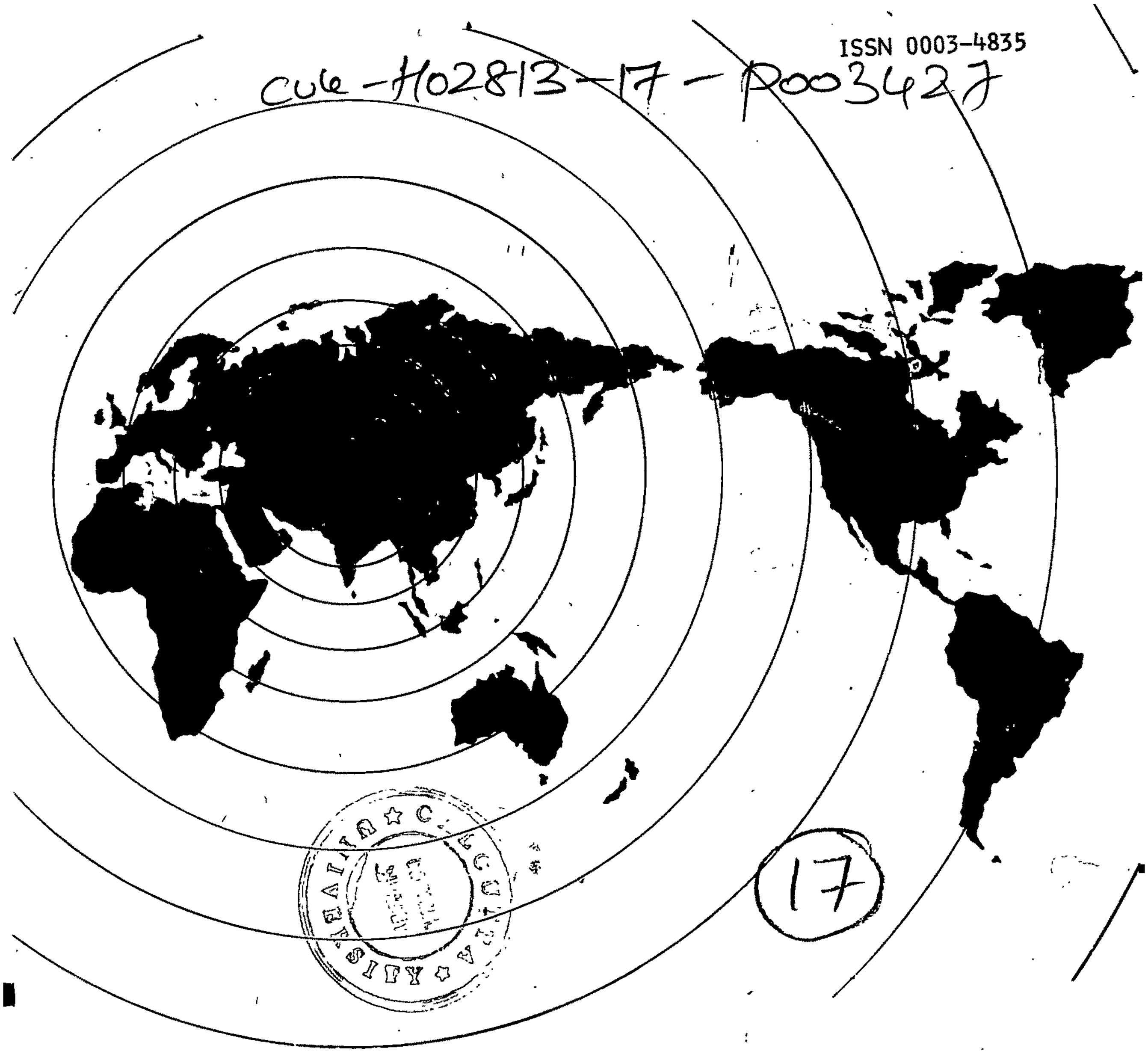

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SOME CONSIDERATIONS ON THE EDUCATION AND TRAINING OF LIBRARIANS AND INFORMATION SPECIALISTS

DR. PETER LAZAR
Member of the Council of the
International Federation for Documentation
FID

Mr. President,
Ladies and Gentlemen,
Dear Colleagues and Friends,

It is my great honour to address this distinguished audience in which many eminent representatives of the highly respected community of Indian librarians and information specialists are present. You all have a deep knowledge of the basic trends in library and information science (LIS) and many of you are well aware of the problems of education and training (ET) of LIS in India, especially the problems of curricula development for the library and information professions.

What I intend to do here is to present to you some views and findings arrived at as the result of a long experience in information system design and management on the one hand, and teaching LIS in various environments on the other. With this background, I have recently carried out a detailed comparative study of LIS curricula from several countries in order to work out proposals for the revision and reorganization of LIS ET in Hungary. Many of my findings and proposals are of a general nature and may be valid for the ET of library and information professionals in other countries as well.

I start with a concise overview of some major events and trends in the development of modern LIS. Next I present a new approach, the system approach to the theoretical foundations of LIS. The third section deals with the main contents requirements of LIS curricula. This is followed by the presentation of some major results of a comparative survey of LIS curricula from several countries. The address concludes with some practical conclusions which might, to a large extent, be valid and applicable in India as well.

1. SOME MAJOR DEVELOPMENTS IN MODERN LIS AND PRACTICE

The following is a highly selective and very sketchy enumeration of the major developments; it does not pretend to be an exhaustive historical survey of the advent of modern LIS and practice. Its aim is rather to emphasize some aspects of the recent history of our professions which may closely affect the curricula for ET of LI personnel.

1.1 Emergence of modern librarianship

"Librarianship, in the sense of collecting and caring for books, has been practised for many centuries, but only within the last hundred years has it begun to take on the characteristics of a profession" [1]. Modern librarianship emerged during the last quarter of the 19th century as a consequence of the rapid development of the library movement, the increase of library holdings and the number of libraries, the growing demand of library services. The foundation of modern librarianship is attributed to M. Dewey, who is considered not only the author of the famous decimal classification

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Revised text of the address delivered at a meeting organized by the Indian Library Association, the Delhi Library Association and INSDOC on 24 May, 1984 at the CSIR Auditorium, New Delhi.

system for libraries, but also the father of modern professional librarianship.

By the end of the last century, the basic technology of librarianship had already been elaborated by Dewey and other eminent librarians, and a large spectrum of rules, methods and tools were already available for the use of the profession.

1.2 Emergence of the information profession

The rapid development of science and technology during the last century resulted in the development of the division of labour in research and development (R and D). Two Belgian scholars, P. Otlet and H. La Fontaine, worked out in Europe the foundations of the theory and practice of documentation and information. The needs of society and the methods and tools elaborated by Otlet and La Fontaine resulted in the emergence of a new profession: the information profession, the representatives of which are called information scientists, information specialists, information officers, informamtion managers, information resource managers, etc. The variety of these names reflects the internal division of labour within the information profession.

Though elaborated and founded as early as in the last decade of the 19th century, documentation and information gained ground only gradually. The ideas and methods invented by Otlet, La Fontaine and others not only led to the emergence of an independent profession, but affected very closely the library profession; they also influenced its methods and thinking. "Information science, then, is not antithetical to librarianship; on the contrary, the two are natural allies, and librarians should not reject this new intellectual relative, nor should the information scientist discredit the librarian"[2].

Since the 50's of this century, the notion of "documentation" is covered in the Anglo-Saxon world by the term "information". In France, the term "documentation" has been retained to denote the activities of the information profession. A clever compromise was found in the two Germanies during the 60's by combining the two expressions and using "documentation and information" as a composite term to denote the profession. In the USSR and some other countries, the term "informatics", coined by Prof. Mikhailov [3], is widely used for documentation and information.

1.3 Emergence of LI education

The emergence of the LI professions generated the need for ET professionals. The origins of modern library ET can be traced in the USA to the last quarter of the last century [1]. Basic characteristics of this first stage of systematic ET were its pragmatism and practicism. Library ET in Europe was based rather on a historical and sociological approach.

Systematic and organized ET in IS is a relatively recent development of the last decades. ET of information specialists is organized and offered either independently or in conjunction with ET of librarians.

1.4 Emergence of theoretical investigations

Modern LI practice and the growing need for well trained professionals very soon required not only the elaboration of practical rules, methods and guidelines which explain how to work, but obviously generated the need for investigations into the theoretical aspects of LI work. It is still a controversial issue whether the theory of librarianship or information should be regarded as a scientific discipline (LIS), or as merely a conglomerate of practical rules and methods, and their application [1, especially p. 64-65]. The late Prof. Dr. Ranganathan was one of those renowned librarians who contributed substantially through their theoretical investigations to the recognition of LIS as a scientific discipline.

1.5 Extension of the types of document handled

As one important consequence of the emergence of documentation, librarianship gradually took note of the fact that there are various types of printed, written or otherwise established documents which have to be handled by the profession for the benefit of the users, in addition to the traditional types, such as books and periodicals.

A similar development was linked to the individual handling of micro-documents, an expression coined by Dr. Ranganathan, that is parts of physical documents, such as journal articles, etc. [4].

1.6 *The information explosion*

The spectacular development of science and technology, and the social and economic development during the last decades, was partly followed and partly generated by the exponential growth of the mass of documents and information to be handled by the LI professions. The information explosion, also called document explosion, has to be considered both as the result and the cause of the research explosion characterized by the exponential growth of R and D activities [5].

The continuous enormous increase in the volume of published and unpublished information sources posed growing difficulties in the handling of the mass of literature for librarians, information specialists and their institutions. It stimulated the publication of secondary information sources, then further types of and methods for consolidation and repackaging of information, and recently the application of modern electronic and reprographic technology to information handling.

1.7 *The increasing role of consolidated information*

Though abstracting and indexing publications had already been published since the early 19th century, the spectacular increase in their publication and widespread availability is a phenomenon of this century. Abstracting and indexing services helped to control the information explosion in its early stages, survey the growing mass of generated documents and select those from among them which might be useful for specific purposes.

During the last decades, the continuous growth of the volume of generated documents and information could not be fully mastered by traditional abstracting and indexing services. The growing need for analyzed, assessed and evaluated information, presented to the user in a form readily applicable, generated information analysis centres, data centres and other similar types of information processing and disseminating centres which provide various types of consolidated and repackaged information [6].

1.8 *Emergence of reprographic technologies*

Newly invented reprographic technologies have been gradually applied to LI work. Soon after the first practical application of microforms during the siege of Paris in 1871, the International Institute of Bibliography, the predecessor of the International Federation for Documentation (FID), advocated as early as in 1905, the application of the microfilm to LI work. Since then, handling and use of microforms, offset printing, copying, etc. became current practices in the LI profession.

1.9 *Emergence of new information technologies*

As a consequence of the second industrial, technical and scientific revolution, modern communication and information technologies have been invented and are still developing. The new technologies, especially electronic technologies, contributed to the revolutionary changes in LIS and practice. This trend started more than hundred years ago, with the invention of the telephone, followed soon by the invention of the typewriter. Later, the establishment of cable and telex communication networks and various types of communication and information technologies were elaborated. Hollerith cards and manual punched cards were introduced into LI work several decades back. Computer applications started in the 50's-60's. Automated selective dissemination of information (SDI) originated in the late 50's. Teleconsulting and teletransmission of documents started in the 60's and the establishment of machine readable data bases in the 60-70's [7].

1.10 *The changing image of the librarian*

This image of the traditional scholar-librarian, which prevailed until the first half of this century, has faded away. It was supplemented by the service-librarian, the library-technologist, the information specialist, whose main function is to serve his user communities. In order to be able to comply with this task, LI professionals have to acquire exquisite knowledge of LIS and practice; they must possess, in addition, adequate knowledge of the subject fields of interest to the users. The LI professions are thus double-faced professions, requiring professional abilities in LI technology, both traditional and modern on the one hand, and highly qualified subject knowledge on the other, in order to be able to serve and advise users as professional partners.

In view of the growing volume and complexity of the library and information infrastructures, the knowledge of the principles and practice of management and the acquiring of relevant skills also belong to the modern image of the well trained LI professional.

1.11 User orientation

During the last decades, the emphsis of LI work was gradually shifting from the traditional technique orientation and processing orientation towards service orientation or user orientation. In order to provide effective service to users, LI professionals have to study and understand the needs and habits of the actual and potential users. Recognizing that serving the users is the ultima ratio of LIS and practice has gained ground gradually, but by far not completely. The trend towards user orientation emphasizes the service aspect of LI work to the deteriment of processing and other technical activities.

1.12 Emergence of information systems and networks

The rapidly growing flow of information and documentation resulted in a higher level division of labour among LI institutions. Systematic cooperation of libraries and information centres has led to the emergence of local, subnational, national and international information systems and networks, not necessarily using highly sophisticated physical-technical communication tools and channels. Information systems and networks help to integrate individual efforts of libraries and information centres, organize resource sharing, improve services – in short: raise the quality and efficiency of LI work.

2 THE SYSTEM APPROACH TO LIS

Though the history of libraries is covering several hundreds, and even thousands, of years, organized library education started only about 100 years ago. In the first stage, ET of librarians was dominated by subjects related to the storage and processing of the holdings. The rather quickly developed core curriculum centred on cataloguing and classification, supplemented by curricula elements on acquisition, readers service, bibliography, later on the history of libraries and the book.

In course of time, this core curriculum was extended by including subjects concening the social relations of libraries on the one hand, and library administration and management on the other. During the last decades, the handling of non-book materials was also added in general to the curricula.

ET of librarians had to face from the beginning the same enormous problem which is intriguing the library profession itself: the librarian's vocation is to handle physically and technically documents, the contents of which he is bound to know well if he wants to be able to fulfil the service requirements of the library. In order to comply with this two-folded task and responsibility, specialization and differentiation within the library profession started already in the last century according to library functions on the one hand, and types of libraries on the other. This trend of differentation did not yield the expected results; ET of librarians suffered from the lack of a systematic theoretical foundation of librarianship [1, 9].

As opposed to the largely pragmatic approach in USA, ET in Europe expected to base itself on historical disciplines for building up an adequate theory of librarianship. This trend is still prevailing in various European countries, especially in Central and Eastern Europe.

A third possible way is presented by the conceptual approach of Dr. Ranganathan who tried to elaborate the foundations of librarianship based upon his well known Five Laws of Library Science [8].

In spite of all these attempts and the efforts of many eminent library and information scientists, the theoretical foundations of librarianship and information work have not yet been worked out in a manner which could be acknowledged universally. Various scientific and professional circles still hold that library and information science cannot be recognized as a scientific discipline.

The general theory of systems [10] provides another approach to the theoretical foundations of LI and practice. The system approach studies the library as a sophisticated, complex information system consisting of interrelated subsystems. Every library is an open system which is closely interrelated with its social environment and is continuously communicating with the environment through various interfaces [11].

As the result of a similar argumentation, every information centre or any specific type of an information centre (information analysis centre, data centre, etc.) can also be considered an open system, the basic structure of which is analogous to that of the system mentioned above with respect to libraries.

The basic model of the information system does not depend upon the specific characteristics of the institution which collects, stores, processes and disseminates information. The structural isomorphism of the model allows its being applied to any type of library or information centre.

A common attribute of the open system is its exchange of matter, energy and information with its environment. In the case of open information systems, the following four main interfaces serve to establish contacts with the environment:

The input interface for the input of acquisitions and the inflow of other types of information from the environment, affecting the behaviour of the system;

- The user interface for the output of information, that is, the information services. This interface is permeable for the counterflow of information from the user to the system in the form of feedback;
- The interface for the input of material and financial resources necessary for the functioning of the system;
- The interface for the inflow (and outflow) of human resources (manpower).

What is the significance of the system approach in its application to libraries and information centres? The structural isomorphism of the information systems modelling both libraries and information centres and the logical homology of these systems provide the philosophical background for the analogous handling of libraries and information centres. ET of LI personnel can be developed on a common basis, justifying the establishment of a common core of subjects which should be included in the curricula for both the professions.

3 MAIN CONTENTS REQUIREMENTS OF THE CURRICULA FOR LIS

3.1 General

Starting from the general scheme of the information system, we can deduct the main contents requirements of ET, the main groups of subjects which must be represented in the core curriculum. From practical considerations, these main subject groups do not correspond exactly to the four main interfaces described in Section 2. First of all, one of the subject groups refers to the internal structure and subsystems of the system. In addition, the acquisition function has been amalgamated with the description of the subsystems of the system.

The core curriculum, with which we deal in the following, covers knowledge of the foundations, theory and practice of librarianship and information work in the narrower sense. ET in subject specialization in any branch of science, technology, social and human sciences, or other practical knowledge, is not the subject of this address. Another important subject omitted is instruction in foreign languages. Knowledge of foreign languages is indispensable for every librarian and information specialist who is expected to render full service to his or her users. But this is another story!

Librarians and information specialists have to know very well the elements of the information system, the functioning of its subsystems and their interlinks. They must be aware of the interrelations of the system with its social environment and of the complex character of these interrelations. Last not the least, they must know how to plan, organize and manage an information system. Systematizing the core curriculum elements, we may establish four main subject groups which form the core curriculum for ET of librarians and information specialists.

The structure of the curriculum presented provides general guidelines for curricula planning, and, in addition, a conceptual framework for the comparative analysis of LIS curricula.

3.2 The main subject groups of the core curriculum

3.21 The social function and role of libraries; and information centres

- The notion and concept of information. Its social function and role;
- The place of the information system in society, in the social process of knowledge generation, communication and absorption;
- Origin and historical development of the forms, elements, tools, role and functions of libraries and information centres;
- Information policy. Its role and share in development policy; in science and technology, economic and social policy; in scientific-technical and socio-economic planning;
- Interrelations with the related fields of publishing, printing, the book trade, archives, etc.;
- Economics of information and information systems; information as a commodity; marketing of information.

The links to society through the user interface might well belong to this subject group as well. In view of the paramount importance of the user interface, it seems to be more advantageous to establish a separate group for the user-system relations, the building up and development of effective user services, which is the ultimate aim and basic function of every information system.

3.22 Information use, information users

- Analysis of the objective demand and the subjective needs of information, that is, analysis of the evident, apparent demand and the latent demand;
- Analysis of the structure of user groups;
- Analysis of information demand and needs in various social settings. Information for R and D, problem-solving, decision-making, top management and other management levels;
- Analysis of information and reading habits;
- Analysis of information use;
- Feedback. Its role and forms. Feedback as a control mechanism and management aid;
- Psychology, pedagogy and sociology of information use and reading.

3.23 System components and their functions. Methods and processes

- Analysis and systematization of information sources;
- Acquisition;
- Processing. Cataloguing, classification. Abstracting, indexing, consolidating, repackaging of information. Analysis, assessment, evaluation of information;
- Translation;
- Library and information services;
- Information technology, both traditional and modern. Applications of computer, telecommunication and reprographic technologies.

3.24 Information system design and management

- System theory. Morphology and classification of systems;
- Methodology of system analysis, design, engineering and management;
- Flow of materials, financial and human resources;
- Work studies, work performance and capacity;

- Work organization;
- Standardization (local, national, international);
- Efficiency, effectivity. Financing, accounting;
- Technical and economic evaluation of the system;
- Planning, control, management;
- Local, national and international information systems, their interrelations. System co-operation.

4. RESULTS OF COMPARATIVE ANALYSIS OF 22 CURRICULA

The study carried out in 1983 covered the curricula of 22 LIS schools and courses from eight countries and one international organization (Unesco) (Annexure 1). The coverage of the study was, most regrettably, limited, because most of the curricula available for comparative study included only lists of subjects and did not contain data about the distribution of the time devoted to the subjects listed. Such curricula can be evaluated only in a very rough manner, according to the presence or absence of subjects, without the possibility to answer the question of the relative share of the included subjects.

Another aspect which limits the validity of the analysis of the curricula structure is, of course, lack of full knowledge of the contents of the subjects enumerated in the curricula. In some cases, detailed information was available about the contents of the course, but in most cases one had to guess in which main subject group the subjects of the curricula should be classified.

Annexure 1 presents the data emanating from the survey, showing the relative share of the four main subject groups in the 22 curricula processed in detail. Annexure 2 shows the range of percentage shares and means in the four subject groups according to library curricula, information curricula and library-information curricula.

A large part of the time is devoted to the subject group of library and information methods, processes and technologies, occupying on the average nearly two-thirds of the total instruction hours. It is interesting to note that the range of the respective hours is varying from 24% to 85%. Even more preplexing is the fact that for library courses, this range extends from 24% to 78% as opposed to the range of 45% to 84% in the case of information courses.

The most surprising finding of the survey is, without any doubt, the extremely low share of the subjects concerning the user interface. This deplorable fact is valid for both library and information courses. While the average time devoted to this subject group does not exceed 3%, there are 7 courses (out of the 22) which do not include any elements of this subject group, for which the maximum share is attained in the case of information and library-information courses.

The social function of libraries and information centres takes up nearly one-fifth of time, on the average, the range being extremely wise (0 to 58%). Library courses fare obviously much better in this subject field than the other courses.

The study of management and its elements is represented on the average with one-seventh of the total hours. Some library courses neglect largely this aspect of education. The maximum share is attained by an information course with 33%.

5. CONCLUSIONS

The analysis of 22 curricula, and the study of other curricula not specifying the amount of time devoted to the subjects taught, leads us to the following conclusions.

5.1 The course contents for the ET of librarians and information specialists is widely divergent in scope and emphasis. It seems that the curricula are not structured in general, according to the prevailing societal needs; they show rather the traditional impact of historical and technical subjects dominating many courses, and additional subjective personal traits of the teaching staff. The course structure seems to preserve its rigidity when observed over time; there is a general lack of dynamism in curricula building.

5.2 Overemphasis on the technical aspects of library and information work can be observed, especially the overrating of traditional library technologies, such as cataloguing and classification.

5.3 Little emphasis can be traced on modern information technology and its application, except in information science courses. Most library courses present technologies of the past, instead of technologies of today and the near future.

5.4 Consolidation and repackaging, assessment and evaluation of information is rarely given the time in the curricula which these important subjects really deserve.

5.5 The poor representation of user studies and related subjects is extremely deplorable. The neglect of the most important aspect of LI work is in striking contradiction to the general trend which reflects the growing social need for user oriented information systems and services.

5.6 Information system design and management is underrepresented in the curricula. The courses do not give, in general, sufficient guidance to librarians, and to a lesser extent to information specialists, in the planning, design, control and management of complex information systems, such as libraries, information centres, data banks, data centres, information analysis centres, etc. and their networks.

5.7 Within the subject group on the social functions of libraries and information centres, library science courses often overemphasize the historical studies (history of libraries, the book, printing, publishing, book trade, binding, illuminating, etc.) and underrate the importance of the social aspects of LI work and the corresponding institutions. The role of libraries and information centres and their staff in the social process of generation, preservation and dissemination of knowledge and information is hardly taught in an adequate manner.

5.8 In the light of recent developments and new trends in LIS, a general review and a detailed evaluation of the existing ET courses and facilities is an absolute necessity for India as well. It is high time to reconcile the actual needs of society and the technical and institutional capabilities available with the contents and structure of the curricula.

5.9 Because of the continuous growth of information needs and the extremely rapid development of information and communication technologies applicable to LI work, a continuous upgrading of the curricula is unavoidable if the LI professions want to synchronize and harmonize the social demand of their services with the practical ability of the professional staff. In order to restore the reputation of the LIS education system, the static pattern of LI curricula has to be superseded by a dynamic pattern.

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Annexure 1: Structure of the LIS Training Courses Processed

No.	Country international org.	Institution	Duration, years	Course character[2]	Relative share of the four main subject groups[1] in the the curricula, %				Inf. source
					1	2	3	4	
1.	Hungary	Teacher training colleges	3	L	14	8	72	6	[12]
2.	”	University of Budapest, Dept. of LS	5	L	22	-	78	-	[13]
3.	”	University of Budapest, Department of LS	2	I, P	4	-	83	13	[13]
4.	GDR	Colleges of librarianship, course for sci. librarians	3	L	40	6	47	7	[14]
5.	”	Colleges of librarianship, course for public libraries	3	L	54	6	34	6	[14]
6.	”	Humboldt University, Berlin, Department of LIS	4	L	54	4	24	18	[14]
7.	”	”	2	L, P	58	3	27	12	[14]
8.	”	Colleges of information science	3	I	18	4	45	33	[14]
9.	”	”	2	I, P	19	7	50	24	[14]
10.	FRG	School of LIS, Baden-Wurttemberg	2	L	19	1	65	15	[15]
11.	”	”	2	LI	17	2	62	19	[15]
12.	”	School of LIS, Koln/Cologne/	2	L	20	-	71	9	[15]
13.	”	”	2	LI	17	-	72	11	[15]

14.	Austria	National Library and university libraries	2	LI, P	9	4	74	13	[16]
15.	Belgium	Universite Libre de Bruxelles	2	I, P	-	5	84	11	[17]
16.	France	Mission interministerielle de 1' inf. scientifique et technique/MIDIST/, Universite des sciences sociales de Grenoble, Universite Claude Bernard de Lyon	1	I, P	9	3	76	15	[18]
17.	”	Institut d'etudes politiques de Paris	1	I, P	-	-	77	23	[17]
18.	”	Universite Claude Bernard de Lyon. UER de mathematiques, Laboratoire d' informatique	1	I, P	6	-	81	13	[17]
19.	India	INSDOC	2	I, P	6	9	60	25	[19]
20.	Senegal	Universite de Dakar. Ecole des bibliothecaires et documentalistes	2	L	6	-	76	18	[20]
21.	”	”	2	I	2	1	85	12	[20]
22.	Unesco	Plan of a course	1	L, I	10	10	53	27[1]	[21]
				Mean:	18	3	64	25	

1/1 = Social aspects; 2 = Information users; 3 = Methods, technology; 4 = Management
2/L = Library course; I = information course; P = Postgraduate course

1/ Including computer science and applications, reprography

Annexure 2: Ranges and Arithmetic Means of the Relative Shares of the Main Subject Groups

	Main subject groups[1/]							
	1		2		3		4	
	R[2/]	M[3/]	R	M	R	M	R	M
All curricula	0 - 58	18	0 - 10	3	24 - 85	64	0 - 33	14
Library curricula	6 - 58	32	0 - 6	3	24 - 78	64	0 - 18	10
Information curricula	0 - 19	7	0 - 9	3	45 - 84	71	11 - 33	19
Library-information curricula	9 - 17	13	0 - 10	4	53 - 74	65	11 - 27	18

1/ 1 = Social aspects; 2= Information users; 3 = Methods, technology; 4 = Management
2/ R = Range
3/ M = Arithmetic mean

Poku, Mary Adu.

The following cross-referenccs may be made:

Mary Adu-Poku.
see Poku, Mary Adu.
Adu-Poku, Mary.
see Poku, Mary Adu.

2. *Compound Surnames*

"The surnames consisting of two or more proper names often connected by a hyphen, conjunction or preposition" are called compound surnames. Some individuals [3] in Ghana have two-worded names, each of which is a common surname.

Examples :
Osei Mensah.
Baah Achamfour.

Any of the above names could be a surname. This problem becomes more pronounced when one considers the fact that some people have a tendency to write their surnames before their forenames. The cataloguer, therefore, becomes confused as to which of the names to use as the entry element.

Besides, there are quite a number of Ghanians who as a result of western influence have both first and surnames European. In most cases, both the names are used as surnames and, as such, it is difficult for a cataloguer to determine which is the surname.

Examples:
Oliver Arthur.
Mends Brown.

In such cases, it may be resolved that the entry element should be the last part of the name, which is generally the "preferred form known" as per AACR (1978) 22.5 c2. Thus, the entry of such names should be as follows:

Arthur, Oliver.
Brown, Mends.

3. *Surnames with prefixes*

Owing to colonial influence, many Ghanaians bear names derived from Portuguese and Dutch sources. Such names often have prefixes and are commonly found in the coastal areas where the influence of the colonial authorities led to intermarriages among them and local women. Examples of such names are given below:

(i) KanKam Da-Costa (first part Ghanaian, second part Portuguese).

(ii) Van-Derpuye (first part Dutch, hyphenated with Ghanaian name).

In such cases, the rules prescribed in AACR [4] cannot be applied, because such names are neither purely Dutch nor Portuguese. In the case of a Portuguese name used as prefix to a Ghanaian surname, it is recommended to enter the name under the prefix, as it is the part by which a person is commonly called. If the order as prescribed in AACR [5] for Portuguese name is followed, the resulting name, i.e. Costa, KanKam Da, will become meaningles. Therefore, the suggested order is: Da-Costa, KanKam.

Similarly, in the second example, reversing the order will make the name meaningless. Therefore, it is recommended that such names should be entered in the natural order, as they appear on the title page, i.e. Van-Derpuye.

4. *Tribal Names*

Some Ghanaians also have their tribal names as their surnames. Some of the reasons given to this are:

(a) Tribal identity
(b) Security
(c) Communality
(d) In some cases, the orignal surnames are difficult to pronounce; hence the use of tribal names is made.

Examples:
Kwame Asante.
Atia Frafra.
Salifu Dagarti.

In the above examples, Asante, Frafra and Dagarti are all major tribes in Ghana. A cataloguer with little or no knowledge of Ghanaina names will enter such names in the last parts taking them as surnames, which in fact are tribal names. People bearing such names are commonly called by their first name. Therefore, it is recommended that such names should be entered as they appear on the title page and the order of elements should be according to the rule 22.4 B of AACR (1978), as given below:

Kwame Asante.
Atia Frafra.
Salifu Dagarti.

5. *Place Names as Surnames*

Quite a few people in Ghana have place names as their surnames. This is often common with migrants who tend to name their children according to where they are born.

Example:
Seidu Kumasi (Kumasi is the name of a city)

For such names, no treatment has been given in AACR (1978). However, it may be resolved that such persons should be entered under the name of place by which they are more commonly identified. Thus, the rendering should be

Kumasi, Seidu.

A cross-reference entry may be made as shown below:

Seidu Kumasi.
see Kumasi, Seidu.

6. *Both Names Islamic*

This is common in the northern part of Ghana, which has about 40% moslem population. In such instances, we find people with two identical names, the middle name being different.

Example:
Alhassan Mohammed Alhassan.

Such names do not appear to pose any problem for the cataloguer, as any one of the two identical parts of the name may be used as the entry element, but difficulty arises in the order of second remove. If the last part of the name is used as the entry element, the order of elements will be:

Alhassan, Alhassan Mohammed.

If the first part is used as the entry element, the order of elements will be:

Alhassan, Mohammed Alhassan.

If the two practices are followed, the works of the same author will be separated in a Dictionary Catalogue.

To avoid any confusion in the choice of entry element and to ensure proper filing, it is recommended that the last part of the name should be used as the entry element.

7. *Names with Titles*

In some Ghanaian names there are titles in vernacular attached to them. This means that unless the cataloguer is conversant with Ghanaian names, he might not know that one of the names is a title.

Examples:
Nii Ayittey.
Ohene Mensah.
Nana Agyei.

In all these cases, the first names, i.e. Nii, Ohene, and Nana, are chieftaincy titles. However, the common practice now is to have people using these titles without being enstooled as chiefs.

Such persons in Ghana are commonly known by their surnames and not by their titles. Therefore, AACR [6] dealing with 'Entry under title of nobility' will not be applied here.

Thus, it is recommended that entry should be made under surname followed by title of nobility, as shown below:

Mensah, Ohene.
Ayittey, Nii.
Agyei, Nana.

CONCLUSION

In the absence of any set of guidelines in AACR I&II, rendering of Ghanaian names is inconsistent, which creates difficulty both for indexers and users. A Ghanaian cataloguer may solve the problems of Ghanaian names to some extent, but a cataloguer from any other country with no knowledge of Ghanaian names will not be able to understand the problems of rendering such names. In this context, C.C. Aguolu writes, "An American or European librarian or bibliographer working on an African bibliography has many serious problems to face. In the first place, he may be unfamiliar with the complexities of the local languages and differences in ethnic distribution and this is found to retard his work and even affect its quality. Secondly, spellings of family names are so inconsistently used in various bibliographical sources that the bibliographer is left wondering which spelling is right [7].

The present study is an attempt to cover comprehensively various problems of choice and rendering of Ghanaian names. If the recommendations made in this work are followed, consistency in cataloguing Ghanaian names will be achieved.

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EIGHTY YEARS OF GRAPE RESEARCH IN INDIA (1901-1981) : A BIBLIOMETRIC STUDY

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An annotated bibliography of Eighty years of grape research in India published by the author in collaboration with a senior pomologist, is used here as a source for this bibliometric study. Data analysis by subject, source, and authorship reveals useful findings. Subject analysis reveals clustering of research in specific subject areas, indicating gaps. Source analysis reveals that journals are the main source of information. Authorship analysis reveals that collaborative research is more predominant in recent years. Indicates that the findings may be utilised by pomologists while designing their experiments and research projects.

INTRODUCTION

Agriculture being essentially a crop science, the users' approach mostly centres round the crop and its cultivation for getting maximum yield. Among the fruit crops grown in India grape occupies the first position in terms of area and production. Viticulture (Grape growing) and Enology (wine making) have increased greatly in importance and popularity over the last few decades. In India grape is grown in tropical, sub-tropical and temperate zones mainly for table purposes. Grape is a highly remunerative cash crop and its successful culture calls for thorough knowledge, skill and experience. Besides heavy investment, it requires close attention and careful nursing. Because of these reasons there is a great demand for grape literature. Looking into these aspects the author, has conducted an extensive literature search on this particular crop and compiled an annotated bibliography entitled *Eighty years of grape research in India (1901-81)* [2]. This work contains 1373 abstracts covering all aspects of grape culture in India since 1901. A wide variety of information sources covering books, journals, proceedings of symposia, workshops and conferences, technical bulletins, pamphlets, reports, theses and dissertation and government brouchures have been scanned. It is thus a comprehensive reference tool for grape workers and is used extensively. The objective of this paper is to use this work as a source for a bibliometric study for the analysis of

> Subject parameters to identify the clustering of research in subject areas of the crop and also to point out gaps of research in specific subjects;
>
> Source parameters to identify the clustering of research in sources of information on crop;
>
> Author parameters to identify the clustering of research by authorship i.e. single authorship or joint/collaborative authorship.

BASIS

Brittain and Lane [1] in their review *Sources of citations and references for analysis purposes* pointed out that selective critical bibliographies may be used as potential sources for the purpose of bibliometric/citation analysis to identify what is best in the published literature provided the bibliography is comprehensive. They further observed that the findings of such analysis may provide useful details of subjects' development, validity of classification schemes and the structure of knowledge. The bibliography which is used here as source for analysis, is quite comprehensive having scanned all important primary sources of information. The extensive literature search carried out at many university libraries yielded as many as 1373 abstracts on a single fruit crop. Therefore, findings reported here have a fair validity and use for application.

METHODOLOGY

Bibliographical references cited in the source book *Eighty years of grape research in India* are used as data for this study. Data is analysed on the basis of subjects, years, sources of references and authorship. Subject analysis is done on the basis of the classification scheme adopted for the compilation of the work.

FINDINGS AND DISCUSSION

The study here is directed towards different aspects of cultivation of grape crop. Crop science manifests under five broad aspects i.e. (i) Crop and its general study and description, (ii) Botanical aspects, (iii) Biochemical aspects, (iv) Agronomical aspects and (v) Plant protection aspects. To study, the subjectwise growth parameters of the crop under these aspects, eighty years bibliographical data have been classified, tabulated, and presented in Table 1. In a span of eighty years from 1901 to 1981, the grape crop had 1373 works, of which the general study accounted for 72 works (5.24 percent); the botanical study of the crop scored 523 works (38.0 percent); the biochemical study of the crop 49 works (3.57 percent); and the agronomic aspect of the crop 506 works (36.85 percent); and the plant protection study of the crop-223 works (16.24 percent). The deficiency of biochemical aspects during the last eight decades is due to the fact that the biochemical researches of the crop started from 1960 onwards. The data clearly indicates that there was no single reference reported before 1961.

Coming to minor subject growth parameters, the data is collected, classified and presented in three tables – Table 3 for minor subject analysis in botany; Table 4 for minor subject analysis in agronomy; and Table 5 for minor subject analysis for plant protection.

It is evident from the table 3 that in the botanical studies of the crop, 193 works (36.9 percent) have been reported on growth and growth regulators; 69 works (13.19 percent) on varieties; 51 works (9.75 percent) on morphology; 44 works (8.41 percent) on plant breeding; 40 works (7.65 percent) on plant propagation;

Table 1: Broad subject/yearwise analysis

Sr. No.	Subject	1901 to 1950	1951 to 1960	1961 to 1965	1966 to 1970	1971 to 1975	1976 to 1980	1981	Total	%
1.	General	7	12	9	30	6	8	-	72	5.24
2.	Botany	6	20	48	132	165	134	18	523	38.10
3.	Bio-chemistry	-	-	1	8	24	15	1	49	3.57
4.	Agronomy	16	17	33	123	161	126	30	506	36.85
5.	Plant Protection	11	5	10	39	91	54	13	223	16.24
6.	Total	40	54	101	332	447	337	62	1373	
	Yearwise percentage	2.91	3.93	7.36	24.18	32.56	24.54	4.52		100

Table 2:

Total number of references, their percentage against areas of studies, in decreasing order of quantity.

Areas of studies	No. of references	Percentage
Botanical	523	38.10
Agronomical	506	36.85
Plant protection	223	16.24
General	72	5.24
Biochemical	49	3.57
	1373	100.00

29 works (5.54 percent) on sexual reproduction; and 23 works (4.40 percent) on mutation and variation. The least number of works reported are on respiration and transpiration with 3 references (0.57 percent). In botanical studies there are eight areas accounting for less than 10 works. The areas are: anatomy, physiology, respiration and transpiration, leaf area and photosynthesis, dormancy, other aspects in physiology, genetics and heredity. Out of these genetics, heredity, anatomy and physiology are the areas of higher extension whereas the rest are areas of least extension. The analysis reveal that clustering of research activity is most on growth regulators and growth and least on repisration and transpiration.

The analysis of agronomic studies of grape presented in Table 4, show as high as 165 works (32.61 percent) is on cultivation methods of the

Table 3 : Minor subject analysis (Botany)

Sr. No.	Subject	1901 to 1950	1951 to 1960	1961 to 1965	1966 to 1970	1971 to 1975	1976 to 1980	1981	Total	%
1.	Morphology	1	3	7	21	15	4	-	51	9.75
2.	Anatomy	-	1	2	-	4	2	-	9	1.72
3.	Varieties	3	3	12	14	22	14	1	69	13.19
4.	Physiology	-	-	-	2	2	3	-	7	1.34
5.	Respiration and Transpiration	1	-	-	-	1	1	-	3	0.57
6.	Leaf area & Photosynthesis	-	-	3	1	1	3	-	8	1.53
7.	Growth & growth regulators	-	2	12	54	61	55	9	193	36.90
8.	Reproduction, sexual	-	3	2	9	10	4	1	29	5.54
9.	Plant propagation & its techniques	-	2	5	10	16	6	1	40	7.65
10.	Dormancy	-	-	-	1	2	1	-	4	0.77
11.	Physiological disorders	-	-	-	1	6	8	-	15	2.87

12.	Other aspects	-	2	-	-	2	2	-	6	1.15
13.	Cytology & Histology	-	2	-	6	2	-	-	10	1.91
14.	Genetics	1	1	1	1	1	2	1	8	1.53
15.	Heredity	-	-	-	-	1	3	-	4	0.77
16.	Mutation & Variation	-	-	1	7	8	7	-	23	4.40
17.	Plant breeding	-	1	3	3	12	20	5	44	8.41
									523	100.00

Table 4: Minor subject analysis (Agronomy)

Sr. No.	Subject	1901 to 1950	1951 to 1960	1961 to 1965	1966 to 1970	1971 to 1975	1976 to 1980	1981	Total	%
1.	Agronomy	1	1	1	7	5	1	-	16	3.16
2.	Farm management	9	-	1	3	3	8	-	24	4.74
3.	Soils	-	2	2	7	7	7	1	26	5.14
4.	Cultivation methods	5	9	15	47	49	37	3	165	32.61
5.	Irrigation	-	-	-	4	5	3	1	13	2.57
6.	Fertilizers	-	1	1	24	52	41	11	130	25.69
7.	Climate/season	-	1	4	7	8	1	-	21	4.15
8.	Harvesting	-	1	-	1	1	2	-	5	0.99
9.	Yield	-	-	-	-	-	3	6	9	1.78
10.	Quality	-	-	1	4	8	6	6	25	4.94
11.	Storage	1	-	3	3	9	8	1	25	4.94
12.	Seeds	-	-	2	4	1	2	-	9	1.78
13.	Preservation	-	2	3	12	13	7	1	38	7.51
								Total	506	100.00

crop; and 130 works (25.69 percent) is on fertilizers, manures and plant nutrients. Preservation, soils, storage, quality, farm management and climate/season account for works ranging between 40 and 20; and works on irrigation, harvesting, yield and seeds range between 1 and 20. This analysis reveals that much of the research is concentrated on cultivation methods

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Table 5 : Minor subject analysis (Plant protection)

Sr. No.	Subject	1901 to 1950	1951 to 1960	1961 to 1965	1966 to 1970	1971 to 1975	1976 to 1980	1981	Total	%
1.	Diseases	2	-	2	2	6	1	1	14	6.28
2.	Bacterial Diseases and control methods	-	-	-	-	4	-	-	4	1.79
3.	Virus diseases	-	-	-	-	4	2	-	6	2.69
4.	Fungal diseases and control methods	8	2	6	19	37	23	9	104	46.64
5.	Non-specific diseases and control methods	-	-	-	-	-	2	-	2	0.90
6.	Pests and pest control	2	-	-	2	-	1	-	5	2.24
7.	Insects & control methods	1	1	2	11	24	13	-	52	23.32
8.	Nematodes & control methods	-	-	-	1	6	6	3	16	7.17
9.	Birds	-	-	-	-	1	-	-	1	0.45
10.	Weeds and control methods	-	-	-	4	9	6	-	19	8.52
								Total:	223	100.00

i.e. 32.61 percent; and fertilizers and manures i.e. 25.69 percent.

The analysis of plant protection studies (table 5) of the crop reveals that most of the research work was on fungal diseases and their control accounting for 104 contributions (46.64 per cent); insects and their control comes next with 52 contributions (23.32 percent). The number of papers on birds and their control, non-specific diseases and their control, bacterial diseases and their control, and virus diseases and their control are 1, 2, 4, 6 respectively.

Yearwise growth.

It is evident from Table 1 that in the first 50 years, the literature output in grape crop was very less amounting to only 40 contribution (2.91 percent) in comparison to literature output from 1951 upto 1981. The growth of Indian literature on grapes from 1951 to 1981 has registered a steep increase and accounted for 97.09 percent of the total output of the period covered. This clearly indicates that the growth of research activity in grape crop has been very rapid during the last thirty years.

22.	4 journals with 7 references each	28	3.04
23.	4 journals with 6 references each	24	2.60
24.	2 journals with 5 references each	10	1.08
25.	7 journals with 4 references each	28	3.04
26.	14 journals with 3 references each	42	4.56
27.	13 journals with 2 references each	26	2.82
28.	39 journals with 1 reference each	39	4.23
	Total	922	100.00

Table 8 : Analysis of authorship

Authors	1900 to 1950	1951 to 1960	1961 to 1965	1966 to 1970	1971 to 1975	1976 to 1980	1981	Total	%
Single author	20	28	55	144	98	58	6	409	29.79
Two authors	7	13	20	119	193	130	28	510	37.14
Three authors and above	2	7	17	65	148	108	17	364	26.51
Corporate Authors	12	5	7	6	6	43	11	90	6.56
					Total			1373	100.00

three or more authors 364 references (26.51 percent) and corporate authors 90 references (6.56 percent) of the work. This clearly indicates that much work was from collaborative research. This trend was less in earlier decades i.e. upto 1960 and greater in later decades i.e. after 1961. It can also be observed from Table 8 that the trend of single authorship has slowly decreased from year to year and the trend of multiple authorship has increased year after year from 1901-1981.

APPLICATIONS

The findings of this study may have the following applications.

The growth parameter of the literature on the subject may be utilized by Indian pomologists while designing their research projects in pomology in general and viticulture in particular, as the findings indicate the different areas of research, clustering as well as gaps in the research activity in the crop.

The findings of source analysis provide information as to the trend of publications. Contribution on viticulture has been published more in horticulture journals than in journals of agriculture and its allied subjects like entomology, pathology, physiology etc. This indication may help scientists or associations or sponsors to go for the publication of more specialized journals.

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INFORMATION – IT'S ROLE AND MANAGEMENT*

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INTRODUCTION

We are living in an information world. This has come about because of the unbelievable scientific and technological progress and the accompanying stresses and strains of society. So much information is being generated that we are confronted with 'information explosion', information pollution' and 'exponential growth' of information. This is causing concern on the communication, distribution, availability, access, and exploitation fronts of information, particularly so in science and technology. Management of information is thus drawing greater attention than ever before.

IMPORTANCE OF INFORMATION

The crucial role that information plays can be gauged from the vast areas of human activities in which it finds applications that include: growth of knowledge and wisdom, decision-making and management, research and development, manufacture and industry, education and training, and academic writing.

Information-knowledge-wisdom:

Human progress has become possible because of the existence and awareness of knowledge created in the past. Knowledge passed on to us from past generations, cultures and societies reacting with the present minds creates new knowledge. The basis of knowledge is information. Information which is the result of a meaningful response to a stimulus, when correlated, synthesized and stratified during the course of time becomes knowledge. Knowledge applied and tested over a long period of time by a continuous stream of minds resulting in its acceptance as truth, becomes wisdom. Thus, wisdom is a part of human heritage. Of course, wisdom once accepted need not be valid to all times and to all societies; it could differ from culture to culture, and from age to age. By subjecting a body of information or knowledge over a long period of time to experience, testing and thinking, knowledge may get extended, modified, created or all together discarded, thus affecting wisdom and society.

Decision-making

All voluntary actions are the results of decisions taken by an individual or a group. Similarly, management is said to be decision-making. To be able to make a wise decision, one should be aware of all the facts concerning the situation or the problem pertaining to which decision is to be made. This means information should be available to the decision-maker. Sound decision-making also depends on the information made available being relevant, accurate and up-to-date. It might also involve foreseeing.

Research and Development

Some of the basic features of scientific research are: invariability, i.e. being verifiable;

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* *Based on the talk given to the First Appreciation Course on Information Handling for Defence R&D, IAT, Pune, December, 1982.*

openness, i.e. available to all those who can make use of it; relatability, i.e. inter- and intra-relationship of subjects; applicability for material development; growth, i.e. capable of further extension of frontiers of knowledge. Communication is common to these features and information constitutes a vital input.

Industry and Manufacturing

A major impetus to scientific research has come from manufacturing, which applies the results of research to production of goods and development of new products. Innovation is the cornerstone around which an industrial enterprise survives today, and can cope up with competition. Innovation is possible through access to latest information and its transfer into physical products and processes.

Education and training

The essence of education is the imparting of knowledge, which in a way is same as transfer of information, primarily through a teacher. A recent trend in education is the introduction of teacher substitute in place of teacher - student situation, resulting in correspondence courses (open universities), programmed instructions, and audio-visual texts. In this context, the importance of information is much more, as the emphasis is more on newer media of communication and self-study than on the teacher. Training on the other hand is concerned with equipping an individual to do a job, i.e. transfer of information/skill pertaining to the job through practice.

Academic writing

Writing, apart from its value to others, is a form of self-expression, which provides immense psychological satisfaction to the writer. Unless one has access to information, academic writing suffers, thereby affecting education.

Individuals, government and society

Living in a technological world without having at least a rudimentary knowledge of technology of things immediately surrounding one is hazardous; hence the need for information to keep the individual informed.

The government is concerned with raising the standard of living and eradicating poverty. Unless full advantage is taken of the capabilities of science and technology, attainment of this objective will remain a dream. Ultimately, it is the government which provides and controls the direction of scientific and technical research. Without communication of information, research and development is unthinkable. Government is equally responsible for development, maintenance and servicing of information for national development.

In recent years, the impact of science and technology on society has been so intense that the norms of social behaviour are changing fast. For right or wrong, it is information which is bringing this change. It is important to ensure that the society benefits from information, and also information is put to maximum use.

USES OF INFORMATION

Information has only dormant value unless it is used. One uses information sources either to acquire or to retrieve specific information or browse to discover new facts. Information itself is used to (a) support or disprove a theory; (b) describe and/or predict; (c) create new ideas; (d) translate an existing idea into a physical development; (e) modify an existing material entity or phenomenon; (f) recreate and; or (g) get psychological satisfaction.

The purpose for which information is aquired or used by the individual indicates his rôle and decides the type of information he seeks. A scientist generally needs latest information of original nature, whereas a development engineer is more concerned with information of applied nature, preferably structured and illustrated. Similarly, a manager's interest is more likely to be in information on marketing, production, government policies and data type, while an educator seeks information leading to knowledge.

Information Chain

Use of information presupposes its availability and supply. An understanding of the pattern

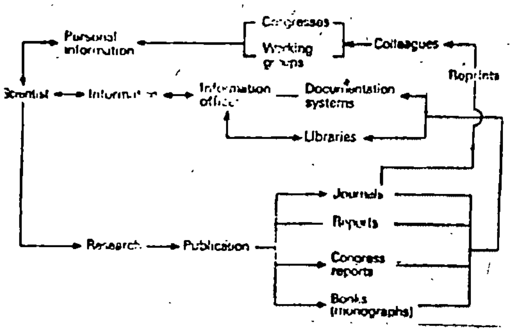

Fig. 1. The present pattern of the information chain.

of information flow/transfer will help us in better organization and use of information. Fig. 1 shows the present pattern of the information chain.

PROBLEMS IN INFORMATION HANDLING/TRANSFER

The phenomenal increase in scientific and technological research and the enormous manpower employed in such activities, coupled with the high growth rate of industries and defence activities have changed the whole complexion of information generation, communication and transmission in the last 30 years. Recent developments in computer and communication technology have given a new dimension to this activity. While the role of information is becoming more and more crucial, its collection, organization, dissemination, and usage and becoming more complicated. This is mainly due to (a) bulk or quantity of information produced; (b) different languages in which it is communicated; (c) proliferation of transmission media; (d) un-eveness of quality, (e) security restrictions; and (f) high rate of obsolescence.

Bulk

So much information is being produced in science and technology alone that the traditional methods of managing information flow have reached almost the breaking point. It is estimated that currently 4-5 lakh research papers are published every year, and this number is growing continuously. *Chemical Abstracts* covers about 4.5 lakhs items a year, *Biological Abstracts*, 2.5 lakhs; *Physics Abstracts*, 1.65 lakhs; and *Engineering Index*, about 1.05 lakhs.

The problems of locating, selecting, collecting, processing and disseminating information are becoming complex.

Language barriers

Publication of research results in different national languages is a barrier to flow of information. It is estimated that of the total output of scientific and technical literature, English accounts for about 50%, Russian 20%, French 10%, German 15% and Chinese 2%. Access to this literature is possible either through learning various languages and/or through translations. Since an individual's capacity to learn languages has limitations, the only practical solution is through translation. The ultimate solution lies in machine translation, though its large-scale use will take a long time to become possible.

Proliferation of Journals

Journals as media of research communication are likely to retain their position for a long time. The current estimate of the number of journals in science and technology varies from 30,000 to 50,000. If we add to this the still-births and post-natal deaths of journals, we get an idea of the proliferation. Every year new journals are born in various disciplines. This prolific growth is choking the communication channel. Separating worthwhile information from the chaff, and identifying original contributions from reptitive ones has become a serious problem, particularly given the limitations of human mind to grasp information and the time available.

Un-eveness of Quality

Information being the product of intelligence, it is extremely difficult to adopt suitable quality control or quality assurance measures. The refereeing system devised to ensure quality and reliability succeeds to a limited extent, and is not foolproof. The problem is further compounded by the bulk, increasing cost of processing, and the different need patterns of users.

Currency

The rate of obsolenscence of information in science and technology is assuming alarming proportions. Information people already talk in terms of half-life of information, which is about 5 years in the West. Probably we are reaching a stage where much of the information will become obsolete before it is published and reaches the users. However, what is obsolete in one context still remains current in another, depending upon the stage of development reached by a country.

Security

Though openess is a feature of scientific research, it does not always work so in practice. This is particularly so in defence research and industrial research. The dilemma is that of deciding what information and how much of it to control without affecting security, at the same time allowing reasonably free flow.

APPROACH TO INFORMATION MANAGEMENT

Information, because of its importance to national development, is considered a national resource. To make full use of this resource, it needs to be managed properly. Some of the problems encountered in managing information have already been discussed. There is no single approach to the overcoming of all these problems. A variety of strategies, methods, machineries, and agencies are employed in the management of information.

Strategies

The strategies centre round the characteristics and inherent properties of information. Some of the characteristics are that information can be analysed, grouped, structured, surrogated, stored, retrieved, extracted, abstracted, summarized, correlated, interpreted, cited, reproduced, translated, disseminated, suppressed and destroyed. All these characteristics are utilized to bring order, enhance use and control the flow of information. Use of citing and correlation property for the development of citation index, abstracting and surrogate characteristics in the generation of secondary publications, are examples.

The exploitation of subject inter-relationship and grouping characteristics minimises the efforts required for selection and collection of information. Probability distribution (Bradford-Zipf) study enables us to identify the most relevant or core publications in a given subject field.

Methods and Machines

Classification and indexing techniques aid in the storage and retrieval of information/documents. Abstracting provides access to the vast reservoir of information disciplinewise. Various reprographic devices and equipment enable us to reproduce published literature in suitable forms and sizes, thereby making supply and distribution quicker and easier. Computer type-setting has cut back printing time.

The real breakthrough in information management has come from computer and communication revolution. Theoretically, it is no longer necessary for each unit to collect, store and organize information; through central processing and storage one can have access via terminals. Conferences and meetings can be conducted through video-telephones and hook-up. Paper books are being gradually replaced by electronic books. Though progress along these lines provides solutions to information problems, it would take a very long time for these to reach the common user in India.

Information handling agencies

Mere existence of literature and information will not be of much use unless they are collected, organized and made available to the needy; this involves an intermediary function. Strategies and machines can only help the user and the intermediary, but cannot replace the latter, at least in the near future. The intermediary function is being discharged by agencies such as libraries, documentation or information centres, information analysis centres and the like. Specialization in this field has lent prestige to the profession of librarianship and information scientists. Information is also becoming a product, and information supply a business.

Library

The primary function of a library is collection, maintenance and servicing of books, journals and other forms of documents. A librarian's major concern is that of collection building and reference service. With increase in the output of newer forms of documents; phenomenal growth in the production of books, journals, reports, patents, standards and theses; and growing subject specialisation, organizing and managing libraries has ceased to be a simple operation.

Documentation Centre

It is an extension of the traditional library functions, with the collection emphasis moving from books and journals to articles, reports and other special materials. The services are geared to meet intensive individual and group information needs rather than general loan and reference needs. Other additional functions discharged by such centres are translation and reprographic services.

Information analysis centres

These centres concentrate on information rather than documents. Information from various sources, both formal and informal, is analysed, evaluated and repackaged. Information is supplied to meet the specific requirements of the user. The output consists of reports, reviews, forecasts, abstracts and data analysis and interpretation.

Personal Information Gathering

The user is the best judge of his requirements. Apart from receiving information through institutionalised agencies, such as libraries, the users have their own private channels for obtaining information. Compared to the institutionalised channels, personal channels are direct, more effective and most fruitful. Information is gathered through personal communication, exchange of preprints, meeting colleagues, attending conferences and symposia or through 'invisible college' membership. Many of the creative scientists, engineers, managers and educationists built up their own personal information systems in the form of diaries or index cards. However, they can no longer afford to have personal libraries in their homes, as in the past.

USER AND THE MEDIATOR

The ultimate objective of any information agency is to fully meet the requirements of the user. To what extent the agency succeeds in fulfilling this is the sole criterion of measuring its effectiveness. To succeed in this task, the intermediary, whether he a librarian or an information scientist, must be resourceful, have sufficient subject background, understand the user and his needs, well acquainted with all the sources of information, and skilled in various information processing techniques.

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TRANSLATION INDEXES IN SCIENCE AND TECHNOLOGY

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Describes some of the important translation indexes in science and technology published in India and abroad which are useful for the the English speaking scientists. Salient features and drawbacks of World Transindex, Translations Register-Index, BLLD Announcement Bulletin, Aslib Index of Unpublished Translations, National Index of Translations, etc. have been discussed.

INTRODUCTION

Translations are a vital source of information like other primary sources such as patents, research reports, periodicals, standards, etc. because it is the only source available to check duplication of knowledge already in existence but not accessible due to language barrier. As translation of scientific and technical documents is very expensive and time consuming, several networks of translation agencies, holding centres and international clearing houses have been developed in various parts of the world which provide access to the existing translations through their indexes.

TRANSLATION INDEXES

Indexes Published in Foreign Countries

Some of the translation indexes in the field of science and technology which are important for the English speaking world are described below.

1. *Translations Register-Index (TR-I)*

It is a semi-monthly publication being issued by the National Translations Centre (NTC), Chicago, since 1967. It is the index of unpublished translations done in the United States and elsewhere. The index has two sections i.e. Register Section and Index Section. TR-I Register Section announces new accessions to the NTC collection. In the Register Section, the translations are arranged under subject headings based on COSATI classification scheme. It also covers translations from other sources including the National Technical Information Services (NTIS). The Index Section of TR-I has two parts: journal citations and patent citation. Reports, standards and other serial publications are included in the journal section. The arrangement of these publications is alphabetical by title. Patents are arranged alphabetically by country of origin. The Index Section of TR-I is cumulated semi-annually for all entries to date in the volume (1).

The drawbacks of this index is that it does not provide subject index for retrospective search on a specific problem as well as the author index for search through author.

2. *BLLD Announcement Bulletin*

It is a monthly bulletin published by the British Library Lending Division (BLLD) Boston spa (U.K.). It lists translations along with British report literature, and doctoral theses accepted by the British Universities [2-3]. All the entries are arranged under broad subject headings and within the ultimate subject according to the type of documents indicated by code. For example, D-doctoral theses comes first followed by R-report, T-Translation and TA-Translation abridges. At the end, this publication provides author index and the address list of the issuing organizations.

The index does not provides source index and subject index for search on specific topic.

3. *Aslib Index of Unpublished Translations*

Since 1951, Aslib is maintaining a central card index of English translations from all the languages on various subjects particularly with emphasis on science and technology. It is purely a location tool for unpublished translations which Aslib uses in handling inquiries on translations. At present, the index contains more than 500,000 entries; the rate of additions of new translations is about 10,000 items per year. Information of translations is collected from over 400 sources in U.K. and from several overseas organisations.

Bibliographic details of translations of periodical articles are filed alphabetically by the title of the periodical in the original language. Within each periodical title, details of articles are filed chronologically i.e. by year, volume, number and pages. The periodical section contains entries for some of the well-known report series and these are filed alphabetically by the report code, and then numerically by the report number, but most reports are filed under the author's name in the author section.

The author section is housed separately from the rest of the index. It includes details of translations which is not a periodical article, patent or standard. If there is no personal author or editor, then it is entered under the issuing organisation. Some items such as decrees and safety regulations are filed under the country of origin.

Patents and standards are filed by country of origin. Patents are usually straightforward, being numbered chronologically. In the case of patents, sometimes the year of issue is a necessary point of reference. Standards are filed alphabetically by the standards code, then by the number [4].

4. *World Transindex*

It is published by the International Translations Centre, Delf (the Netherlands) jointly with the Directorate General for Scientific and Technical Information Management of the Commission of the European Communities in Luxemburg and the Scientific and Technical Documentation Centre of the Central National de la Recherche Scientifique (CNRS) in Paris. The *World Transindex* was formed in 1978 by merging the following publications [5-8].

i. *World Index of Scientific Translations and List of Translations Notified to the International Translations Centre;*

ii. *Transatom Bulletin;*

iii. *Bulletin des Traductions*

World Transindex announces about 32,000 translations per year from all the source languages into all the target languages. It consists of five sections i.e. references, source index, author (personal) index, corporate author index and patentee index. In the references, the translations are arranged according to subject headings based on the COSATI system and within the subject heading according to World Transindex Reference Number. The source and author indexes are cumulated annually.

An important feature of *World Transindex* is that it includes many translations that are published in the selected article journals including a substantial number published as part of the US Joint Publications Research Service. These are not announced in other translations indexes. The list of periodicals currently translated cover-to-cover is published in its issue number 1 and in the annual index. A microfiche edition of *World Transindex* is also being considered.

The drawback of this index is that it does not provide subject index for retrospective search by specific topics.

World Transindex Database

It is a database of *World Transindex* which is produced by means of the PASCAL system developed by CNRS. Information announced on translations is stored simultaneously in a central database. It permits the production of profile printouts. It is available for on-line access also [8]. Since 1st Sept, 1980, this database was made available on-line to users as file 33 of the Information Retrieval Service

(IRS) in Frescati, Italy. This is accessed from U.K. via the Dialtech Service of the Department of Industry. World Transindex Database holds details of scientific and technical translations collected since 1978 by the International Translations Centre in the Netherlands and CNRS. As the information is on-line, it is easy to provide various approaches to information such as type of documents, target/source languages, publication year, title and subject index terms [13, 14].

5. *Journals in Translation*

It is a guide to journals containing translations. It is published jointly by the International Translations Centre, Delft, the Netherlands and the British library Lending Division, Bostan spa (U.K.). This publication lists journals which are translated cover-to-cover, or selectively, together with journals which contain translations of articles selected from multiple sources. It contains nearly 1000 titles, current and ceased and covers all subject fields. In addition to the main alphabetical listing of titles, it provides a KWIC index, an index of original titles and a list of publishers and/or distributing agents.

A comfiche version of *Journals in Translation* is available from the Instituto de Informacion y Documentacion en Ciencia y Tecnologiya, Joaquin Costa 22, Madrid, Spain [3, 11].

6. *Index Translationum*

It is an annual bibliography of translated books, published by the UNESCO since 1948. It covers only translated books in all the subjects from various countries of the World. The entries are arranged by the name of countries and within the country, under ten major divisions of Universal Decimal Classification. Under the subject headings, entries are arranged by author and where appropriate, by editor or compiler (for anthologies), in alphabetical order. An alphabetical index of principal authors is provided at the end of the volume [12]. The thirtieth edition of index translationum - 1981 contains 50, 428 books that were translated during 1977 in seventy countries [13].

INDEXES PUBLISHED IN INDIA

1) *National Index of Translation (NIT)*

The NIT is a monthly index of unpublished translations done in India, and being brought out by the Indian National Scientific Documentation Centre (INSDOC), New Delhi since January 1981. It lists unpublished English translations of scientific and technical documents. It covers periodicals, monographs/books, patents, standards and specifications, research reports, manuals, proceedings of seminars and symposia etc. published in foreign languages. The entries are arranged under various subject headings derived from Universal Decimal Classification scheme and within each subject heading according to their authors [14]. NIT announced 2500 translated items in 1981. Each entry in the NIT provides information on author, translated title, source language, pages, citation, name of translation agency and translation number.

Specimen Entry of NIT

UDC No.	546.3.9
Author	OKADA Y, SANTO T
Translated title	New surface treatment of magnesium (Japanese), 8 pp.
Cation	Kinzoku Hyomen Girjutsu 1978, 29(12), 661-4.
Translation Agency	INSDOC, New Delhi
Translation No.	TN - 23177

At present, this publication is providing an author index and permuted subject index as supporting indexes. The inclusion of permuted subject index is the unique feature of this publication. However, this publication is deficient in the following areas:

(1) NIT does not provide source index i.e. index of periodicals/publications indexed;

(2) Inconsistency in presentation of the title of the periodicals/documents.

2) *DESIDOC Transindex*

DESIDOC Transindex is the index of translations done at or procured by Defence Scientific Information and Documentation Centre (DESI-

DOC), Delhi. At present, it is an annual index of English translations of periodical articles, reports, patents, conference proceedings, standards and specifications, monographs, books, manuals (instructions, operational, repair etc) which are of interest to Defence R&D. This index has been started since 1980.

In this index the translations are arranged under broad subject headings. It provides author, source, subject and translations number indexes for searching information from various approaches. Each entry in the main part of index provides information regarding author, translated title, complete reference, place of availability and translation number.

3) *Translation Bulletin*

It is a quarterly bulletin published by Bhabha Atomic Research Centre (BARC), Trombay, Bombay. It is an index of English translations done at BARC and covers translations mainly in the field of nuclear science. The arrangement of translations in this index is language-wise. Each entry provides information regarding BARC - translation number, translated title of the articles, author and reference. It does not provide any supporting index such as author, subject, source etc. for search.

4) *NAL Technical Translations*

It is an index of scientific and technical translation in English in the field of aeronautics done at the National Aeronautical Laboratory, Bangalore. In this index, translations are arranged under standard subject headings based on the NASA thesaurus. Each entry gives the name of the author, the translated title in English, the source of publication of the original article and the NAL translation accession number. It provides author index and language index.

NAL Technical Translations 1980 contains a complete list of 635 technical translations from French, German, Russian, Italian, Japanese, Swedish, Czech, Dutch, Polish and Ukranian which were undertaken by the NAL upto the end of July 1980.

5) *Index to Translations (BHEL)*

Index to Translations is published by the Corporate Research and Development Division of BHEL, Hyderabad. This index is a list of current holdings of translations available at various Technical Information Centres of BHEL. The index is organised according to broad groups reflecting the product profile of BHEL and disciplinary areas of interest such as Applied Mechanics, Heat Transfer, Tribology etc. Entries are repeated in more than one group wherever they are of a multidisciplinary character. Each provides information regarding author, translated title, reference and source language. An author index is appended to the bibliographic part of the index. *Index to Translations* - 1980 lists translations acquired or carried out till April 1980 and contains 833 titles.

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Appendix - 1

Technical Details of National and International Services

1. *World Transindex*

Coverage : Periodical literature, patents, standards, reports, books proceedings, etc.
From : all source languages
Into : all target languages
On : all the fields of science and technology
Frequency : Monthly
Delay : several months
Issued by : International Translations Centre, Delft, the Netherlands
Status : International

2. *Translations Register-Index*

Coverage : Periodical literature, patents, standards, reports, books, proceedings, etc.
From : all source languages
Into : English only
On : all the fields of science and technology
Frequency : Semi-monthly
Delay : several months
Issued by : National Translations Centre (USA)
Status : National

3. *BLLD Announcement Bulletin*

Coverage : Periodical literature, patents, standards, reports, books, proceedings, theses, etc.
From : all source languages
Into : English only
On : all the fields of science and technology
Frequency : Monthly
Delay : several months
Issued by : British Library Lending Division Bostan Span (U.K.)
Status : National

4. *ASLIB Index of Unpublished Translations*

Coverage : Periodical literature, patents, standards, reports, books, proceedings, etc.
From : all source languages
Into : English only
On : all the fields of science and technology
Frequency : Not published
Maintained by : ASLIB, London
Status : International

5. *Index Translationum*

Coverage	:	Books only
From	:	all source languages
Into	:	all target languages
On	:	all subject fields
Frequency	:	annual
Delay	:	several years
Issued by	:	UNESCO, Paris
Status	:	International

6. *National Index of Translations (India)*

Coverage	:	Periodical literature, monographs and books, patents, standards and specifications, proceedings, etc.
From	:	all source languages
Into	:	English only
Frequency	:	Monthly
Delay	:	several months
Issued by	:	INSDOC, New Delhi
Status	:	National

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UNIVERSAL AVAILABILITY OF PUBLICATIONS : PROBLEMS AND PROSPECTS

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Defines Universal Availability of Publications, its evolving conceptions, and its international and national dimensions. Discusses practical problems pertaining to Universal Availability of Publications and provides possible solutions.

INTRODUCTION

It has been man's continual quest to be able to identify, locate and have access to all records published anywhere and in any language, which might be of interest to him. The objective of Universal Availability of Publications (UAP), a concept propounded by Maurice B Line [1], is the widest possible availability of published material to intending users. UAP means

> 'that every published document, whenever and wherever published should be available to anyone who wants it more or less where he wants it — its presence in a reference collection, a long way from the users, is not enough' [2].

The objective of UAP is the widest possible availability of published material (i.e. recorded knowledge issued for public use) to intending users, wherever and whenever they need it. It is an essential element in economic, social, educational and personal development. The UAP programme aims to improve availability at all levels, from the local to the international, and at all stages, from the publication of new material to retention of last copies, both by positive action and by the removal of barriers. UAP aims at ensuring that existing improved access to information on documents through universal bibliographical control (UBC) [3] is matched by improved access to the documents themselves.

EVOLUTION OF THE CONCEPT

The concept of UAP, like so many innovations in post-war librarianship, originated with Donald Urquhart, and was in fact stimulated by UBC. Urquhart argued that it was of no use- indeed it was positively frustrating - to provide an ever fuller and faster supply of references if the documents to which they referred could not be obtained.

In fact, the need of UAP was recognised in 1973 when IFLA Committee on International Lending put forward a resolution urging the acceptance by each country of responsibility for making its native publications available to other countries [4]. The first formal recognition of the need for UAP came in November 1974 when the IFLA Committee on International Lending and Union Catalogues put before the General Council meeting a resolution in the following terms:

> "As an essential element in any programme of national and international library planning, and as a natural concomitant of UBC, efforts should be made both within each country and between countries to improve access to publications, by increasing the availability and speed of interlending services and by developing simple and efficient procedures. The ultimate aim should be to ensure that all individuals throughout the world should be able to obtain for personal use any publication, wherever or whenever published, either in original or copy".

So far, most of the practical responsibility for furthering UAP has rested with IFLA office for International Lending, established at Boston Spa in 1975 with Maurice B. Line as director. The IFLA Congress held at Strbske Pleso, Czechoslovakia, in August/September 1978, had UAP as its theme, and divisions and sections devoted much, if not most, of their effort to UAP. The only major research carried out up to now is a comparative study of National Interlending Systems [5], done by the IFLA office for International Lending on contract to UNESCO, which has expressed its full support of UAP. About 300 copies of this study were distributed by UNESCO to national libraries and UNISIST focal points.

Potentially most significant of all recent developments is the International Congress on UAP held in Paris in May 1982. Problems identified as constraints to the availability of publications were discussed during the congress and effective solutions were sought.

BARRIERS TO UAP

Having discussed the concept and need of UAP let us examine the difficulties in achieving UAP. The term UAP implies two things:

(i) Availability of the world's publications,and

(ii) Availability of publications to all in the world.

The former requires a comprehensive collection of world's publications whereas the latter is responsible for universal lending. Thus there are two sets of problems:

(i) Problems in making a comprehensive collection.

(ii) Problems in universal lending.

Making a comprehensive collection of all world's publications is not simple. It should be the responsibility of each country to document its published out-put. The legal deposit laws should take care of this problem in each country. But, not all countries have adequate deposit laws. Even if the laws exist their coverage may not be comprehensive and their application may not be thorough. The problem of a comprehensive collection of world's published output becomes more pronounced when one finds that much of the recorded knowledge is semi-published (i.e. appearing in the form of reports, distributed in limited numbers) or is available in non-book form such as sound recordings, films, video tapes, slides and other audio-visual media. UBC aims at ensuring that bibliographical records, in a standard form, are provided for publications all over the world. Much progress has already been made but a great deal is yet to be done. Not only has the output of many developing countries, still to be documented, but even among developed countries it is difficult to claim total coverage of publications, both currently and retrospectively.

Even if the recorded knowledge is comprehensively collected in a given country, yet this does not necessarily result in availability. If single copies of all the country's publications are collected in one place or divided among several libraries, these copies may not be used, off the premises. It means either the needy readers, specially those at distant places, should travel to that place or a copy of the publication be routed to them. If the first method is followed, the problems of cost, distance, inconvenience will prevant the readers to use the materials. The second method is not hundred percent successful even in most developed countries having best lending systems. For example in Great Britain many documents that are not available locally cannot be supplied from elsewhere. The inter library loan system can claim a satisfaction rate of over 95%, but 4% or 5% of 3m requests a year represents 120,000-150,000 documents - allowing for non-existent items, say 100,000 documents a year [6]. Not only that, a survey of the U.K.'s ability to supply British publications to other countries on inter-library loan showed that about 20% of non-journals (monographs, theses, official publications etc) could not be provided [7]. Some, but by no means all, of these were difficult or obscure items. The situation in the Federal Republic of Germany, another country with a well-developed interlending system, is less satisfactory, and in most countries it must be worse. The reasons are not far to seek. In the first place, it is difficult to loan out rare material, available in one or two copies only. Secondly, book materials can be loaned out more easily than audio and/or visual material. It is much easier to provide current publications in this way than publications of the past, whose regulations may not permit lending. It is necessary to emphasise the obvious that no country in the world can claim to make available all its current publications to any individual in any part of the country. National availability is the backbone of the universal availability. Thus, when country-wide availability does not exist, it is impossible to talk about world-wide availability.

POSSIBLE SOLUTIONS

The problem of universal availability of publications may be tackled in two steps as given below:

(i) *Developing national loan centres*

In 1973 IFLA Committee on International Lending put forward a resolution urging the acceptance by each country of a responsibility for making its native publications available to other countries [8]. Organisation of inter-lending system must be a concern of individual countries. However, some of the methods of achieving this kind of access are discussed below:

(a) Comprehensive Collection: There should be a centre in each country which can acquire and loan out all native publications. National libraries or legal deposit libraries may assume the function of such a centre. British Library Lending Division is an example of this type.

(b) Union Catalogue: Another method of national availability of publications is a system depending upon union catalogues. National union catalogues or regional union catalogues of different forms of publications will provide access to the holdings of a large number of libraries throughout the country. There are many example of such systems. However, the total costs of systems relying on union catalogue can be higher than those of a central loan collection.

(c) Comprehensive Collections cum Union Catalogues: Between the above two extremes, one can have a system relying partly on centralised collections and partly on union catalogues or systems based on the holdings of a few libraries. For example, in U.K., the inter-lending system depends on union catalogues extensively for older publications and foreign-language books; the main national union catalogues are maintained by the lending division, but there are also regional union catalogues, mainly of fairly recent British and other English language books.

(d) Cooperative Acquisition Programmes: Another method for securing availability of national publications comprehensively is to divide the subject or subjects in a group of libraries each of which will assume responsibility for coverage of the subjects assigned to it and any purchasing done by a library in a field chosen by another will be a conscious duplication.

All the four methods mentioned above have some drawbacks. For example, with systems relying on union catalogues and cooperative acquisition schemes, it is difficult to ensure comprehensive coverage whether in the acquisition or retention of material. Moreover, the service provided by these methods will be slow, because the requests have to go through a centre before reaching a library that holds the material. If the material is not available in that library, the request may have to go to another library. Here also the material may be in demand locally and cannot be loaned out. It is only natural that the needs of the library's local clientele must always have priority over request from other libraries.

In view of the above, the only alternative left is the photo-copying of such rare, hard-to-get or archival materials, provided the borrowing library is ready to bear the cost. This will mean lending the item completely. It will give rise to the problem of copyright. The copyright legislation may inhibit or completely rule out the possibility of photocopying, meaning thereby that the materials which cannot be loaned out cannot be got at all. Extensive phtocopying may damage the material specially the bound books which is against the archival policies. Besides, the items to be photocopied may be in great demand locally also, which will delay the process.

(ii) International Exchange of Publications

However, a national centre with comprehensive collection will be responsible for making its publications available either on loan or by supplying photocopies both inside and outside the country. A national centre will be charged with the following functions:

(a) To screen the requests that are sent from its own country to other countries. This is important, because a particular item requested from abroad may be locally available. It is, therefore, implicit that the National Loan Centre, should not only be comprehensively stocked but also be fully equipped with union catalogues representing total national collection.

(b) To receive the requests of other countries and make available the needed items.

It is the concern of the individual country to decide how it organises and finances its National Loan Centre. The latter may be financed directly by the state, cooperatively by libraries or run by a library association. In order to make the system workable the following suggestions are made:

(A) Establishment of National Loan Centre, changed with the function of making the national collection available to other countries, should be the responsibility of state government of each country. The idea which by now is implicit should be made explicit in the UNESCO's Charter. Much is yet to be done specially in developing countries in order to achieve UBC and UAP. UNESCO should encourage the establishments of national loan centres by providing financial assistance.

(B) A close cooperation between National Lending Centre and National Library, which is a state funded organisation and is supposed to receive all the native publications under a legal deposit act of that country, is highly desirable. It may be suggested that National Lending Centre may function as one of the important units of the National Library, or the two may function in coordination with one another under a higher body.

(C) National archives should be linked with National Loan Centre. This will help in making available the photocopies of the requested archives. In the case of rare books or manuscripts, it is better to get at least three photocopies of each item. One copy may be kept in the National Loan Centre, another for the use of local clientele and the third may be preserved. It will not only increase the availability of such material but also reduce the physical handling of rare collection, thus making it less susceptible to wear and tear.

OTHER POSSIBLE PROBLEMS IN THE EXECUTION OF UAP PROGRAMME

(i) Service Cost: Quick transmission of information is the backstone of UAP. One of the obstacles in fast international lending is the process of making claim and repayment of costs. It will not be practicable to make this service free of charge. Even, at times, recovery of the cost of lending becomes unavoidable. If transmission is to be fast enough, the items will have to be mailed by air which will entail additional cost. In the case of photocopies, the Copyright Law may compell the recovery of full cost. In any case, such costs must be far smaller than the costs of purchasing the required items and the total cost incurred on any country for a year's international borrowing must be very small, if not negligible as compared to its total library expenditure.

To simplify the process of recovering the cost of lending, a system of prepayment has been put forward. Libraries, receving most of the requests, can fix their own charges and sell their own loan forms or coupons which may be brought from them in advance. Requests are accepted only if these forms or coupons are used. However, while talking about UAP it will be useless to presume that the requests will be concentrated to a few libraries, in which case, shifting currency exchange rates throughout the world may make it impossible to establish standard charges and to sell its own loan forms and coupons for all requests. However, these problems may be reduced in future but complete solution seems to be like a wild goose chase.

(ii) Delay in transmission : Two to three months delay in transmission is generally experienced. The reasons are many. When a request is received in a library, the needed item may already be out on loan. The request then has to go to another library holding the same item. Even if the item is available, the library may be reluctant to loan it out because it is likely to be away for about six months or so. If the library lends out the item, other requesting libraries may be kept waiting. Moreover, if the item is sent by surface mail, it is going to take a very long time. The alternative methods such as sending the items by air mail or sending a facsimile, are too expensive. A fast turn-round time may however, be suggested to make the system more feasible.

(iii) International Library Loan Code : For the purpose of international lending, different countries are using different types of request forms which vary in their sizes, contents and layouts. To standardize the procedures of international lending, a set of rules in the form of 'International Library Loan Code' must be formulated. It should lay down clearly, the purpose, responsibility of borrowing libraries and that of lending libraries, scope, expenses, method of placement of request, duration of loan, notification and acknowledgement, violation of code and standard format of loan form. Such a code should be widely circulated and strictly followed. A brief *Guide to National Centres of International Lending and Photocopying* was prepared by IFLA office for International lending. However, such rules need revision and reinforcement.

(iv) Customs : Custom regulations may prove to be another barrier of UAP. Custom officials are more suspicious about Audio and/or Visual materials and other non-book materials. However, this problem may be solved by putting authorized labels from National Loan Centres.

(v) Censorship : Due to some socio-political reasons, certain publications are prohibited within certain countries. Such problems seem to have no remedy.

(vi) Copyright Law : In view of high cost of the production of periodicals, libraries have cut down the subscription of periodicals. This has led to an increased demand for photocopies from elsewhere. However, the publishers are demanding, and rightly too, that some payment should be made to them for photocopies. They are also demanding that some restrictions be imposed on photocopying. In such circumstances, the import of photocopies from other countries may even be restricted if not completely prohibited. Different countries may pass some laws which may restrict the photocopying and require the payment of royalty to the publishers. However, the enforcement of such laws is by far not an easy job, specially when copying library is in another country. Such trends are, however, extremely serious for UAP.

CONCLUSION

The UAP programme aims to improve availability of publications from the local to the international level. Before thinking about the accessibility of items, one should be able to know where a particular publication is available. This points to the concept of UBC. In fact, both UAP and UBC are complementary to each other. While the former locates a particular item, the latter tries to find the means of its availability. The universal availability depends upon national availability. A national library or any other appropriate institution should be designated as 'National Centre for Interlending' which should be made responsible for all requests for document whether by way of loan, photocopy or microform received/sent abroad. National libraries, by powers already vested in them, should be able to assume the role of focal point for the UAP programme and collect and publish relevant statistics without the need for additional legislative or administrative back-up. Underlying all of this, one cannot overemphasise the need for an effective telecommunication and postal system.

The crux of the problem lies in the fact that the idea of UAP though essential for economic, social, educational and personal development, is not cent per cent practicable. As a matter of fact, UAP as Maurice B. Line [10] himself remarks, "…. is not an all or nothing concept". To this author, it is a never ending process and any progress made in the availability of publications will take it a step forward.

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INCREASING THE UTILISATION OF THE COLLEGE LIBRARY – IS IT BEYOND CONTROL?

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An ideal library should have schemes which promote self-learning among individuals through effective utilisation to the maximum possible extent the available library facilities, thereby enhancing the utilitarian value of the library and justifing the investment on it. A study of library centred education conducted at Madras Institute of Technology shows that it is an effective means to increase library utilisation.

INTRODUCTION

Continuous scientific research, inventions, innovations and creativity not only lead to information explosion but also pose a challenge to the scientists and technologists in retrieving information. "The information scientists are called upon to build an infrastructure of information transfer with the main objective of providing the right information to the right person at the right time"[1]. New techniques have been developed to access computerised data bases for information through on-line/off-line facilities. The information explosion and the new techniques of retrieval have hardly affected the average college libraries, since conditions in a majority of these institutions have been stagnant over decades.

PRESENT STATE

The less prepared students working for industry, find it difficult to follow their industrial leaders working on contemporary research, design or development problems. Moreover, the importance of a solid foundation is most apparent to a student only after graduation, since a professor is no longer available to provide him guidance.[2]. Colleges, therefore, aim at providing a balanced and broad-based curriculum and opportunity for the development of the potential of students. The library accordingly is expected to support teaching, research and extension programmes of the college in achieving its objective. The library has an important role to play in the development of the potential of the students. "It is a well-known fact that the effectiveness and indeed the usefulness of a library are measured primarily by its reading public"[3].

College libraries continue to be a mere formality or in some cases just an ornament. A library is mostly used as a warehouse of books. The faculty do not utilise the library services to the possible and desirable extent due to lack of time or interest. Many seem to have the impression that they can manage with their old stock of information and knowledge. They have, therefore, not considered the library as a necessary source of information[4,5]. There is no wonder, therefore, if students too have not realized the importance of library. The students and faculty alike have not recognized and valued the potentials of libraries. There is reason to believe that students feel that there is no correlation between the use of library and the grades they obtain[6]. This seems to be the basic reason for the inadequate use of library by students.

INFLUENCING FACTORS

Based on attitudes and use patterns of both students and teachers, it appears that the majority do not use the library because the complex nature of the libraries and unfamiliarity with the system make them confused and frustrated and finally force them to turn away from the libraries[7]. On the other hand, in many colleges, there are no reading facilities at all for students and in some colleges even though facilities are available, only a very few use the libraries[8]. The real challenge, therefore, is to innovate means and methods to attract more students and teachers to the libraries and to enthuse them to utilize the facilities effectively.

Before considering such means and methods, the factors which influence the utilization of libraries should be identified in order to make the best choice or to use the best method. The conventional closed access system, inadequate space and congestive atmosphere are known as negative factors which hinder utilization. Other main factors which affect utilization are:

1. Library rules,
2. Stagger system,
3. Non-issue of books during the examination period,
4. Ignorance about the resources,
5. Apathy of students,
6. Apathy of teaching staff,
7. Financial problems.

Library rules

Rigid rules framed for the purpose of streamlining the procedures for both the users and the library staff discourage users. Lack of flexibility in library rules sometimes causes frustration among the users and leads to mutilation of books.

Stagger system

Observation shows that most of the college libraries have systematised the issue procedure adopting the stagger system, in which books for a particular class are issued on a particular day. Arrangements are made in such a way that all the classes are covered within a week. Though this system permits the use of less library staff, it keeps away the enthusiastic readers, thus defeating the real purpose of the library. A person has to wait for one week for his next chance. The stagger system in issue procedure is found to be the main reason for low utilisation of libraries.

Non-issue of books during the examination period.

After a great deal of efforts, the students locate and select the books meeting their requirements. In the hope that they can prepare for the university examination using the books thus obtained, the students later realise that their expectation have not materialized. In an attempt to safeguard the college property, the librarian recalls all the books before the examination. The hall tickets of the students are used as the best weapon for this purpose. The librarian gets the satisfaction that he has adhered to the rules, but he fails to recognize that he has kept aside the very basic law of library science "BOOKS ARE FOR USE". This leads to mutilation of books.

Ignorance about the resources

The college libraries are seldom utilized to the desired level, because the users do not have the opportunity to realize their potentialities. In one study it was found that "Prospective teachers were not capable of using library materials satisfactorily and their knowledge of available library resources was limited"[9]. There is very little utilisation of books other than the textbooks, even though these books provide simple and more useful material than the prescribed textbooks.

Apathy of Students

Much of the literature is made available to students. But studies reveal that only a few students use the libraries sufficiently for the purpose of general reading. Sometimes formalities keep the students away from the library. The student generally does not like to approach the library staff for assistance.

Apathy of teaching staff

Increasing the utilization of libraries in colleges is more the responsibility of teaching community rather than that of librarians. Following only one textbook not only limits the scope of the students to acquire knowledge, but also keeps the students away from the libraries. In practice, it is noticed that the members of the teaching community not only stick to one textbook but also give the exact pagination to be referred to by the students. This ultimately leads to the craze for particular books and also to a certain extent tearing of the required pages from the book. Quite often, if a student raises intricate questions or requests the teaching staff for textbooks, the student gets the advise:

> "If you are taking down the notes given by me in the classroom, a good second division is certain. Why do you bother about the book? This is the beginning and also the end of reading performance by many students in many of the colleges"[10].

Financial problems

The libraries are conventionally treated as accessories[11]. A second place, is, therefore, given to the budgets of the libraries. Library budget is the one that is pruned whenever there is shortage of funds. Usually inadequate attention is paid to the needs of the libraries. As the basic needs are not met, the aims of increasing the utilization of libraries and their development are rarely fulfilled.

INCREASING THE UTILIZATION

Motivation

"Educational psychologists, supported by well-established empirical evidence, are quick to point out that the straight lecture method without opportunity for discussion is one of the least effective methods of instruction"[12]. Accelerating the utilization of libraries, like increasing the production in industries, cannot be achieved all of a sudden. Students should be encouraged to read books in the library outside the textbooks prescribed. The University Grants Commission in its revised guidelines for restructuring of the courses at the degree level has said "The existing teaching methods, which are largely based on rote memory, lectures and reproduction, should be replaced by new teaching methods which can awaken curiosity of students, encourage self-study habits and promote problem-solving skill in them. There must be some component in the curriculum which requires every student to use the library for reference work. Once such a component is introduced, this should be taken into account in strengthening the library for reading and reference materials, including journals"[13].

Use of library by students, as stated, depends on faculty motivation. Dr. S. Sathikh points out four levels of teaching:

1. Giving facts and figures
2. Explaining/relating the facts
3. Demonstrating/proving the facts
4. Inspiring/motivating to search for themselves.

These are given in the increasing order of motivation. Motivation should be of the kind that will inspire students to work independently with the help of library material, of course, with adequate instruction regarding the use of library and the bibliographic tools. Educational institutions may also allocate certain percentage of marks in their internal assessment for library usage by students. The library staff also must play a complementary role to increase the effectiveness of teaching.

User education

P.S. Kawatra stresses the need to educate the members of the institutions on the use of library and search for information in order to increase the effective utilization of library. He quotes Prof. Holloway. "Library resources are the major insurance against narrow syllabus, dogmatic teaching and simple out-of-dateness. At a time of flexible conditions and growing independence for students as to the planning of their work, the library, not the lecture room, forms the heart of the enterprise"[14]. Mrs. Ruth Alston, Librarian, Cambridge University, has recorded the observations of a British research scholar made after a seven week research tour in India, studying user education in Indian academic and research institute libraries. "Virtually everyone I interviewed thought that the stock of Indian libraries was significantly underused because of user ignorance, and many thought that the information profession had not, on the whole, succeeded in projecting a good image of its capabilities." Quoting this, R. Saradha emphasizes that our institutions of higher learning should initiate appropriate steps for user education to bridge the gap between potential and achievement[15]. The library should serve as a laboratory for the implementation of effective teaching. The library should be made an integral and functional part of teaching in the classroom.

INNOVATION

Objective

Considering these views, a new scheme was planned at the Madras Institute of Technology with the following main objectives:

(i) to develop creative thinking and self-learning among students,

(ii) to complement the classroom lectures,

(iii) to encourage students to develop means for making better utilization of their leisure time,

(iv) to assist students in developing better values and higher standards in their profession,

(v) to help students to develop research techniques for use both during and after student years.

(vi) to expand the scope of education for a more complex world,

(vii) to help the members in retrieval of information of maximum usefulness in dealing with practical problems and situations,

(viii) to expose the students to the latest information and to ensure that the knowledge acquired is both meaningful and relevant.

Initial experiment

Rote learning of certain materials and reproducing them in examinations has become an outmoded way of education, since the real knowledge is lost sight of in this method. Keeping in view the fact that a library is not just a reservoir of books, but an educational agency, the library of the Madras Institute of Technology, Anna University, Madras, has provided 3 hours for undergraduate classes and 6 hours for postgraduate classes in the timetable, as library period with the aim that this would enable the students to do their design assignments and seminar preparations effectively. However, it was found that the library period was not fully utilized by the students till December 1982, due to lack of adequate reading room and other facilities and proper motivating factors.

Improved method

The fundamental aim of any educational programme should include means for generating dynamism and inculcating the spirit of search, research and self-reliance in learning latent in every individual. With this in view, the Institute introduced a "Library Centred Education Scheme" towards the end of the academic year 1982-83, i.e. February 1983, not only to increase the utilization of the library, but also to encourage the use of the library as a laboratory for effective teaching. Library Centred Education includes learning by students on their own in the quite corner of the library under the guidance of the faculty members in respect of the topics and with active bibliographic assistance provided by the library staff.

To attract readers and to encourage study habit, the library should have a conducive atmosphere in the form of spacious and well-equipped reading room, etc. Lack of such atmosphere was initially a hindrance in carrying out this scheme. The Director of the Institute realized this lack of facility and he urged the provision of the necessary facilities in the library. The space was trebled; reading room furniture and display racks were quadrupled, new books and periodicals of current interest were added and displayed; and publicity was given through notice/bill boards. These measures have facilitated implementation of this scheme in an effective manner.

Table 1: Number of visitors before implementation

Month & Year (1)		No. of working Days (2)	No. of visitors (3)	Ratio (3)/(2)
July	1982	28	2,946	105.21
August	1982	27	3,200	118.51
September	1982	29	2,614	90.14
October	1982	14	1,020	72.85
November	1982	27	3,691	136.70
December	1982	27	3,155	116.85
January	1983	24	2,533	105.54
February	1983	28	3,286	117.35

Table 2 : Number of Visitors After Implementation

Month & Year (1)		No. of working Days (2)	No. of Visitors (3)	Ratio (3)/(2)
March	1983	30	3,735	124.50
April	1983	26	3,257	125.26
July	1983*	14	1,699	121.35
August	1983*	11	1,827	165.54
September	1983	27	4,428	164.00
October	1983	26	4,464	171.69

* *Classes were not fully held during the months of July and August due to water shortage. May-June was summer vacation.*

Library centred education

The scheme does not mean mere conduct of classes in the library. It is a kind of tutorial in search of required materials by individuals. The departments assign interested and motivated members of the faculty to organize the library classes in their respective branches of study for all classes both at undergraduate and postgraduate levels. The faculty members intimate the topic they would discuss in the library, a day in advance. The library collects and keeps ready the selected material available, such as journal articles, books, textbooks, reference books, etc. in the library, for reference. During these hours, the students are taught about the usage of reference materials and information searching techniques and are also asked to cite some of the references on the prescribed topics. It is relevant to point out here that the material collected by the library staff, for the above purpose, fully met the requirements of the topic

Table 3: Number of Volumes issued before implementation

Month & Year		No. of working days (D)	No. of Members (M)	No. of Volumes issued (I)	Ratio (R)
July	1982	28	524	2,364	0.1611
August	1982	27	524	2,488	0.1758
September	1982	29	524	2,298	0.1512
October	1982	14	524	735	0.1002
November	1982	27	687	3,117	0.1680
December	1982	27	687	3,011	0.1623
January	1983	24	687	2,802	0.1699
February	1983	28	687	3,002	0.1561

Table 4: Number of volumes issued after implementation

Month & Year		No. of working days (D)	No. of members (M)	No. of volumes issued (I)	Ratio (R)
March	1983	30	687	4,206	0.2040
April	1983	26	687	3,601	0.2016
July	1983	14	526	1,510	0.2051
August	1983	11	526	1,902	0.3287
September	1983	27	526	4,591	0.3232
October	1983	26	526	4,494	0.3286

A marked increase in the value of the utility ratio 'R' on implementation of this programme is evident from the date given in Table 3 and 4.

under discussion; this was appreciated by the faculty. Thus, the library has proved that it can contribute to enhancing the effectiveness of the teaching programme.

Some Initial Inferences

It is observed that a few students and faculty members could also be assigned the responsibility of aiding the library staff on the previous day in assembling the required material. Student involvement will automatically familiarise them with the system.

UTILITY

To measure the effectiveness of this programme, if its utility has been reviewed over a period of five months before and after its implementation (Tables 1 and 2).

The ratio of the number of visitors to the number of working days has been taken to provide a measure of the extent of utilization. Comparison of the data in Tables 1 and 2 gives a vivid picture of the increased utilization of the library. The utilization has increased by 50%. This scheme has been actively implemented from July 1983.

Increase in the number of visitors alone cannot be a pointer to the increased utilization of the library, since the purpose of the visit may not necessarily be to utilize the library resources. Hence, taking the number of volumes issued during this period into account, a new evaluation was worked out. Normally, the number of volumes issued depends on the following factors:

(i) Number of members of the library

(ii) Number of working days.

Taking these factors also into consideration, a utility ratio has been computed as follows:

$$R = \frac{I}{M \times D}$$

Where R = Utility Ratio
I = No. of volumes issued
M = No. of members
D = No. of working days.

SCOPE AND LIMITATIONS OF THIS STUDY

Limitations

The limitations of this study are:

(i) All the members are not utilizing the library.

(ii) The number of volumes consulted inside the library premises has not been included in this study.

This programme is not without problems. This type of programme may not fit the general taste of college students and perhaps some faculty, since it introduces certain elements of compulsion.

Advantages

Knowing the resources of the library

This counselling technique adopted under the Library Centred Education Scheme brings into light the hidden treasures in the quiet corners of the library and also exhibits the resources and potential of the library to its members. The library staff actively collect the material by consulting various sources about the availability of which many of the readers may not be aware.

Educating the library staff

It is a fact that all the staff working in libraries are not in a position to retrieve the information required by the reader. This programme educates the library staff in respect of the techniques of finding material and information from various sources.

Stimulating reading habit

The students have not only an opportunity but also an element of compulsion to scan through the material available to them.

Meeting the Career Requirement

Many of the needs of students are best met by working with them in groups. The student is encouraged to learn by himself for his present and future needs and to make use of the library to his own benefit. Library Centred Education helps the student to grow in maturity and self-understanding so as to be able to acquire knowledge in general as also specifically relevant to the career which he contemplates to adopt. It also helps him to overcome the feeling of helplessness when he needs information in his professional career, since this type of teaching equips him with the ability to explore ways of finding information individually. This unquestionably is the need of the day.

CONCLUSION

Effective and efficient library service plays an important role in the process of education. The authorities of the college/institution and the librarian can create interest among the readers either by extending to them all the facilities needed or through a subtle method, instead of keeping the library a sterile vacuum.

A college library operates under two main climates:

i) the climate of the library itself, and
ii) the immediate operating environment of the organization of which the library is a subsystem.

These two should be conducive to the successful working of the system in respect of the facilities required by the users as well as the working conditions needed for the staff. The Library Centred Education Scheme implemented by M.I.T. is found to be an inexpensive way of providing these two climates. Its planning and implementation do not require the services of specialists. What is needed is a group of readers (staff and students) who believe in usefulness of this programme. The first year, particularly the first few months, of the student's life in the college is the time that brings about the maximum change in his attitude. Hence, students should be helped to make intensive use of libraries during this period. Inculcation of the habit of self-study is equally important.

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SOME LESS CONVENTIONAL SOURCES OF INDUSTRIAL INFORMATION

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A brief account of less conventional industrial information sources is given. Need for a detailed survey of such sources, and regular and systematic collection, storage and dissemination of information contained in them is stressed.

INTRODUCTION

Information seekers, in general, consult published and conventional sources of information such as encyclopaedias, handbooks, monographs, reviews, abstracting and indexing periodicals, primary journals, etc. However, if the information sought, is on a particular industry or on some industrial topic, the relevant information is not usually available in the above mentioned conventional sources. In such cases, one has to obtain the information and data from various less conventional sources which include unpublished sources. Such situations generally arise with techno-economic information, though quite often, technological information like details of processes or machinery and equipment is also not available in standard books. Even if such information is available, processes followed in the country are not known.

These less conventional sources of industrial information come in various forms such as irregular mimeographed publications, reports of meetings, papers read in seminars, feasibility studies, project reports, market reports, handouts and other publicity materials, hand written manuscripts as well as oral communications. Such sources are available to any one, but the generators and holders of this type of information are so many that locating them often becomes a difficult task.

Much of the technological and techno-economic information is accumulated in the offices of all the government departments and agencies dealing with industrial development, R&D centres, manufacturers' associations, consultancy organizations and financial institutions. Besides, industrial institutions are one of the important sources of such material as they are prime generators of industrial information.

In the following paragraphs the less conventional industrial information sources are discussed at some length under two heads, viz. (i) technological sources, and (ii) techno-economic sources.

LESS CONVENTIONAL SOURCES OF TECHNOLOGICAL INFORMATION

Processing of raw materials, details of machinery and equipment, and description of manufacturing processes are generally available in encyclopaedias, monographs, journals, etc. However, this is not true with each and every industrial product. Specially, when the industry is less important or smaller in size, it becomes rather difficult to procure such information. Particularly, when one is seeking information on the process followed in the country, the problem becomes all the more difficult.

The following are some of the less conventional sources of such information: (i) newsletters or house journals of large industrial houses; (ii) survey reports on industries prepared by various agencies of central or state governments; (iii) Tariff Commission reports; (iv) impact schemes and prospect sheets prepared by the Small Industries Development Organization (SIDO); (v) annual reports of the

R&D institutes engaged in industrial research or information available with them in the form of know-how, expertise or experience; (vi) technical analysis reports prepared by organizations dealing with industries and ad-hoc and irregular publications brought out by them; (vii) various reports prepared by public or private consultancy organizations engaged in feasibility report preparation, design and engineering, plant erection, etc.; (viii) advertisements of industrial products; (ix) publications like standards and specifications, British Pharmacopoeia (B.P.), Indian Pharmacopoeia (I.P.), etc. which sometimes give manufacturing and other technical details.

Though the main aim of newsletters or house journals of R&D organizations or business houses is not to cover technological information, there are house journals like *Changing Scene* of Indian Oxygen which sometimes discusses the technological developments in the field, the organization deals with.

For one reason or the other, from time to time, the Government of India or various state governments have been conducting surveys on different industries. One example of such report is *Examination of Indian Tannin Materials with Reference to Ink Manufacture,* published as Bulletin No.80, Department of Industries, Government of Bengal, which gives details of writing ink manufacture. Such detailed information is not available in any standard sources.

Similarly, the Tariff Commission reports or impact schemes/prospect sheets prepared by SIDO are good sources of technological information, though their basic aim is different from providing details of manufacturing processes. For example, the details of zip fasteners is given minutely in *Zip Fastender Industry,* published by Indian Tariff Board, Government of India, Bombay, 1951.

Similarly, *Barbed Wires,* published as Small Industry Scheme No.34, Development Commissioner, Small Scale Industries, Government of India, New Delhi, 1956, has been the only source of information on barbed wires.

Annual reports of R&D institutes sometimes are vital sources of information, specially when a particular institute is the only one engaged in a topic on which information is not available elsewhere. In case, the institute has developed a process or product, it serves as a source of know-how for that process/product. For example, the Regional Research Laboratory, Hyderabad, is the proper source of information on the manufacture of hydrogenated castor oil as the Laboratory has developed a process for the manufacture of this product.

Sometimes R&D scientists having sufficient expertise with them serve as important sources of a particular information.

A few organizations bring out at periodical intervals technical analysis reports on the industries they are dealing with. The Electronics Commission is one such organization which has been bringing out such reports on various electronic industries which are very informative.

The consultancy organizations, on the basis of published information as well as by undertaking detailed surveys, provide a number of services like preparation of project feasibility reports, detailed designs including plant layout, product development, defect analysis and its remedy, turnkey project services, etc. In this process, they accumulate a lot of information which is hard to be found elsewhere.

Sometimes, the technological information has also to be culled out from publicity materials and advertisement of industrial products.

Though their aim is to provide information on standards, specifications and quality control, publications like ISI specifications, B.P. or I.P. have stood many times the lone sources of technological information. For example, while compiling an article on stoves industry for 'The Wealth of India - Industrial Products', the author of this paper had to depend solely on the ISI specifications on the project for the manufacturing process of stoves. Similarly, for an article on surgical dressings, B.P. proved to be the solitary source of information on the topic.

LESS CONVENTIONAL SOURCES OF TECHNO-ECONOMIC INFORMATION

Techno-economic information mainly encompasses information on manufacturing units, their capacities, production, demand, consumption, targets of capacity and production, prices, export, import, etc.

The conventional sources of such information are annual reports of various organizations involved in industrial development, government publications like 'Guidelines for Industries', 'Statistical Abstracts India', Annual Survey of Industries', 'Monthly Statistics of Production of Selected Industries of India', 'Monthly Statistics of Foreign Trade of India', etc.

The above sources are generally backdated while industrial periodicals meagrely cover such topics. In such circumstances the recourse is only to less conventional sources.

Ad-hoc and irregular publications, appearing generally in mimeographed form, brought out by various organizations serve as relatively up-to-date sources of information. The *Indian Chemical Statistics* 1981-82 brought out by the Department of Chemicals & Fertilizers, Ministry of Petroleum, Chemicals & Fertilizers, Government of India, New Delhi, is an example of such publications. In the past, the same organisation has brought out a similar publication on drugs and pharmaceuticals industry. The Department of Petroleum has also been issuing similar publications from time to time, on petroleum and petrochemical industries. However, all such publications are for restricted circulation.

Newspapers, specially economic and commercial ones, apart from covering full articles on certain industrial topics give, at one place or the other, a passing reference to techno-economic information on one industry or the other.

Most of the papers while discussing the industrial or market situation often reveal some vital information. For example, *Trends* column in the *Hindustan Times* sometimes presents a number of manufacturing units of a particular product indicating whether the industry is old or being set up for the first time in the country. Sometimes production figures and capacity are also given.

In other papers such information is covered under the headings Industrial Studies, Economic Information, etc.

Besides, Chairmens' statement at annual meetings of the firms published in the newspapers or items like Company Reports of *Financial Express* or Company Profiles and Company Notes of *Chemical Times* serve as useful sources of techno-economic information.

Even announcements for equity shares or debentures give a brief picture of a particular industry in the country. Tender notices give an idea of the manufacturer or supplier of a particular product. This is also true with advertisements of industrial products.

Newsletters of some manufacturers' associations and regular or ad-hoc publications of industrial development corporations or banks are also good sources of techno-economic information. For example, the *Newsletter* issued by the Vanaspati Manufacturers Association presents every detail about the Indian vanaspati industry. Similarly, the Bank of India issues two regular leaflets, viz. (i) *Economic Information*, and (ii) *Industrial Studies*. The former provides latest techno-economic news and the latter presents a detailed profile of a particular industry like Indian glass industry, Machine tools industry, etc.

Annual reports of public and private industries and handouts or publicity materials brought out by them also serve as information sources of techno-economic information. Industries having R&D units also provide technological information in their reports.

Besides, publications or literature brought out by the stock exchanges may also prove to be a good source of information.

Consultancy organizations enaged in the preparation of demand studies, techno-economic studies, export potential studies, market surveys or project identification are, in fact, one of the up-to-date sources of techno-economic information. It is, however, hard to extract such information from private organizations without paying a good price for their products.

As is the case with newspapers, industrial periodicals also give stray data which need careful scanning of each and every item and culling out useful information.

BIBLIOGRAPHIC CONTROL

The foregoing descriptions of less conventional sources of industrial information are based on the author's personal experience. There might be many more sources of such information; at present, there is no bibliographic control of them. In fact, generators and holders of such sources are so many that locating them would be a topic for a big project. The bulk of such heterogeneous information sources are neither catalogued nor abstracted.

CONCLUSION

Keeping in view the increasing importance of such literature, it is high time for one of the organizations dealing with industrial information to take up the survey on such sources and their generators, and collect, store and disseminate them widely. It should also generate increasing awareness about the usefulness of this information among its prospective users. The organization that takes the initiative also find out ways and means of bibliographical control on such information so that it may come within the ambit of formal information systems. This organization could be separated as a depository of all possible less conventional industrial information sources.

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CITATION ANALYSIS OF EARTH SCIENCE LITERATURE

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Presents an analysis of the citations in the Annual Review of Earth and Planetary Sciences, Vol. 1-9, 1973-81. Features a ranking list of 82 journals representing 76% of the total citations out of the 833 titles cited. Gives countrywise and subjectwise distribution of the journals in the ranked list.

INTRODUCTION

Earth science has steadily grown into a multidisciplinary field of study, involving geological, geophysical, geochemical, geomathematical, geotechnical, extraterrestrial, offshore exploration, environmental studies, etc. The fast growing number of geoscientists in the world, now estimated at around 500,000, has resulted in corresponding proliferation of earth science literature. According to a survey of the world geoscience literature conducted by Connor [1], approximately 20,000 citations recorded in 1955 reached the figure of 89000 in 1977, showing an yearly increase of 7%. At this rate, the present output of geoscience literature is estimated at over 1,20,000 references per annum. The number of journal titles in geosciences is estimated at 4000.

The multidisciplinary nature of earth science also involves the distribution of information in a wider number of journals. This rapid growth of geoscientific literature compounded by the spiralling rates of journal subscriptions places a severe constraint on any library's limited resources to acquire the literature for use of the geoscientists. To assist the geoscience libraries in selecting useful journals, a citation analysis has been undertaken to identify significant serial titles.

METHODOLOGY

Several sources have been recommended by Brittain and Line [2] for collecting and analysing the references or citation. These include: Abstracting and indexing journals; national or other general bibliographies; primary publications; and review journals. The use of review journal, recommended by Sen Gupta [3], has been made in this study as a source for citation analysis. Though the review publications are not entirely free from language, country or other biases, they do afford a fairly reliable means of evaluating the quality of journals, with their built-in qualitative assessment of scientific contributions by renowned specialist reviewers.

The *Annual Review of Earth and Planetary Sciences,* Vol. 1-9, 1973-81, has been taken as the source journal for ranking earthscience periodicals. Articles dealing with planetary and atmospheric sciences have been omitted from the study. Citation data have been collected from nine volumes extending to a period of nine years to allow for any large variation in citation counts. A total of 98 review artcles have given 8484 citations with an average of 86.5 citations per article.

ANALYSIS

The frequency of distribution of serial and nonserial publications in terms of citations is given in Table 1. As expected, the serial publications occupy the predominant position (80%), followed by monographs (12%) and seminar proceedings (3.5%).

Table 1 : Frequency of citations in serial and other publications

Form of literature	*Number of citations*	*Percentage*
Journals	6776	79.86
Monographs	1027	12.11
Seminar Proceedings	304	3.58
Theses/Dissertations	138	1.62
Reports	117	1.40
Maps	34	0.40
Others	88	1.04
Total	8484	100.00

The ranking list of journals is presented in Table 2. In all 833 titles have been cited, of which the first 82 with 12 or more citations, representing 10% of the total number of journals, have been taken as significant titles and given in the ranking list.

J Geophys Res confirms its top rank as already shown by Garfield [4], followed by *Geol Soc Am Bul.* Two of the major general science journals, *Nature* and *Science,* have achieved a high rank, indicating their importance.

The 82 journals in the ranking list represent about 76% of the total citations, whereas the remaining 751 titles have contributed to about 24% of the journal citations. It may be noted

Table 2A : Ranking list of journals

Rank	Journal title	Country-wise publication	Year of first publication	Number of citations	Percentage
1	2	3	4	5	6
1	J Geophys Res	US	1896	570	11.10
2	Geol Soc Am Bul	US	1890	326	6.34
3	Nature	UK	1869	296	5.78
4	Science	US	1895	246	4.80
5	Geophys J R Astron Soc	UK	1958	245	4.77
6	Earth Planet Sci Lett	Netherlands	1966	220	4.28
7	Geochim Cosmochim Acta	UK	1950	208	4.05
8	Am J Sci	US	1818	159	3.09
9	Contr Mineral Petrol	Germany	1947	138	2.70
10	Bul Seismol Soc Am	US	1911	131	2.55
11	Am Mineral	US	1916	128	2.50
12	Tectonophysics	Netherlands	1964	113	2.20
13	Am Ass Petroleum Geol Bul	US	1917	112	2.18
14	Econ Geol	US	1905	100	1.95
15	J Geol	US	1893	89	1.73
16	US Geol Surv Prof Pap	US	1902	84	1.63
17	Can J Earth Sci	Canada	1964	79	1.54

1	2	3	4	5	6
18	Phil Tr R Soc Lond Ser A	UK	1887	77	1.50
18	EOS Tr Am Geophys Un	US	1920	77	1.50
19	Geol Soc Am Abstr Progr	US	1969	71	1.38
20	J Sedim Petrol	US	1931	67	1.30
21	Carnegie Inst Wash Yearb	US	1902	61	1.10
22	Rev Geophys Space Phys	US	1963	58	1.13
22	Deep Sea Res	UK	1953	58	1.13
23	Phys Earth Planet Inter	Netherlands	1967	53	1.03
24	Geol Soc Am Mem	US	1934	51	1.00
25	J Palaeontol	US	1927	48	0.93
26	Geology	US	1973	46	0.90
26	J Petrol	UK	1960	46	0.90
27	J Geol Soc Lond	UK	1845	45	0.87
27	Bul Earthq Res Inst Tokyo Univ	Japan	1926	45	0.87
28	Int Geol Congr Rep	Int	1878	41	0.80
29	Initial Rep Deep Sea Drill Proj	US		37	0.72
30	Geophys Res Lett	US	1974	35	0.68
31	J Phys Oceanogr	US	1971	33	0.64
32	Dokl Acad Sci USSR, Earth Sci	USSR	1922	32	0.62
32	Quatern Res	US	1970	32	0.62
33	Am Geophys Un Monogr	US		31	0.60
33	Geochem Int	US	1956	31	0.60
34	Int J Rock Mech Min Sci	UK	1964	30	0.58
35	Geophysics	US	1936	28	0.55
36	Pr R Soc Lond	UK	1800	27	0.53
37	US Geol Surv Bul	US	1883	26	0.50
37	Geol Mag	UK	1864	26	0.50
37	Sedimentology	UK	1962	26	0.50
38	Soc Econ Paleontol Mineral Soc Spec Publ	US		25	0.49
38	Pt Lunar Sci Conf	UK	1970	25	0.49
39	Mineral Soc Am Spec Pap	US		24	0.47
39	Acta Crystallogr	Denmark	1948	24	0.47
40	Geol Soc Am Spec Pap	US	1934	23	0.45

1	2	3	4	5	6
41	Geol Surv Can Pap	Canada	1935	21	0.41
41	Micropaleontology	US	1955	21	0.41
42	Ann Rev Earth Planet Sci	US	1973	20	0.39
42	Phil Mag	UK	1798	20	0.39
42	Clays Clay Miner	UK		20	0.39
42	Pure Appl Geophys	Swiss	1939	20	0.39
42	Scheiz Mineral Petrogr Mitt	Swiss	1920	20	0.39
43	Geol Rundsch	Germany	1910	19	0.37
43	Mar Geol	Netherlands	1964	19	0.37
43	Pr Nat Acad Sci	US	1915	19	0.37
43	Can Mineral	Canada	1921	19	0.36
44	C R Acad Sci	France	1835	18	0.35
44	Mineral Mag	UK	1876	18	0.35
44	Lithes	Norway	1968	18	0.35
44	J Geomagn Geoelectr	Japan	1945	18	0.35
44	J Mar Res	US	1937	18	0.35
45	Bul Volcanol	Italy	1924	17	0.33
45	J Phys Chem	US	1896	17	0.33
45	Precambrian Res	Netherlands	1974	17	0.33
46	Lethaia	Norway	1968	16	0.31
46	Chem Geol	Netherlands	1966	16	0.31
46	Z Kristallogr	Germany	1877	16	0.31
46	Phys Chem Min	Germany		16	0.31
47	Palaeontology	UK	1957	15	0.29
48	Geotimes	US	1956	14	0.27
49	Naturwissenscheften	Germany	1913	13	0.25
49	Oceanology	USSR	1965	13	0.25
49	Bull Geophys Obs Addis Ababa			13	0.25
50	Sci Am	US	1846	12	0.23
50	Phys Chem Earth	UK	1956	12	0.23
50	Fortschr Mineral	Germany	1911	12	0.23
50	Radiocarbon	US	1959	12	0.23
Total 82 titles				5141	100.00

Table 2B : Analysis of citations in journals

Journal titles	No. of citations	Percentage
First 5 journals in the ranking list	1683	24.84
First 20 journals in the ranking list	3536	52.20
Total 82 journals in the ranking list	5141	75.86
Total 751 other journals, each contributing less than 12 citations	1635	24.14
Total 833 journals	6776	100.00

Table 3 : Subjectwise distribution of journal citations

Subjects	No. of titles in ranking list	Total No. of citations	Percentage of citations
General Science	10	789	15.35
General Geology	22	1574	30.62
Geophysics	15	1449	28.19
Palaeontology/Stratigraphy	6	149	2.90
Mineralogy	9	277	5.40
Petrology	5	174	3.38
Geochemistry	4	270	5.35
Oceanography/Marine Geology	6	178	3.46
Economic Geology	2	212	4.12
Geotechnology/Engineering Geology	1	30	0.60
Geochronology	1	12	0.23
Lunar Science	1	25	0.50
Total	82	5141	100.00

that as many as 422 journals have been cited only once.

Table 3 shows the breakup of citations according to subject classification of the 82 journals of the ranking list. General geology and geophysics journals account for the major proportion with 30.62% and 28.19% citations respectively. General science journals have a significant contribution of 15.35%, due no doubt to growing interdisciplinary studies in geoscience. Mineralogy, petrology and geochemistry are closely related and have together contributed to 14.17% of the total citations.

Countrywise distribution of journals in the ranking list is given in Table 4. As expected, the majority of journals are published from USA (56%) and UK (23%), followed by the Netherlands (8.5%) and Germay (4%).

Table 4 : Geographical distribution of journals in the ranking list

Country of publications	No. of journals in the ranking list	No. of citations	Percentage
Canada	3	119	2.31
Denmark	1	24	0.48
France	1	18	0.35
Germany	6	214	4.12
International	1	41	0.80
Italy	1	17	0.33
Japan	2	63	1.24
Netherlands	6	438	8.54
Norway	2	34	0.66
Saudi Arabia	1	13	0.25
Switzerland	2	40	0.78
UK	17	1194	23.25
USA	37	2882	56.02
USSR	2	45	0.87
Total	82	5141	100.00

Table 5 : Distribution of journal citations according to their period of publication

Periods	Ranked journals (82 titles)	Unranked journals (751 titles)	All journals taken together
1976-80	1069 (20.8%)	177 (10.80%)	1246 (18.40%)
1971-75	1788 (34.80%)	438 (26.80%)	2226 (32.85%)
1961-70	1856 (36.10%)	624 (38.10%)	2480 (38.60%)
1951-60	258 (5.00%)	173 (10.60%)	431 (6.35%)
Pre-1950	169 (3.30%)	223 (13.70%)	392 (8.80%)
Total	5140	1635	6775

It may be noted that no Indian journal appears in the ranking list. Only two Indian titles have featured among the 833 journals cited and contributed a mere 6 citations.

Table 5 presents an analysis of the journal citations distributed over different periods. It is observed that the ranked journals have contributed a relatively small percentage (8.30%) of citations pertaining to period prior to 1960 as compared to unranked journals contributing 24.30% of citations for the same period. It follows from this analysis that one has to place equal reliance on core journals as on the journals from fringe areas for significant older contributions in geosciences. This finding would guide the weeding out policy in a geoscience library.

CONCLUSION

This study provides a list of significant journals in the field of geosciences, obtained through an objective assessment based on citation analysis of a review journal. As suggested by Brittain and Line, it would be worth while to undertake similar studies based on other sources, such as analysis of references in primary publications or abstracting and indexing journals and bibliographies, for comparative study of the merits of different sources. The findings would provide a valuable tool for the evaluation of primary and secondary publications.

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INFORMATION GATHERING HABITS OF R&D SCIENTISTS : A SURVEY

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The present analysis is a case study depicting information gathering habits (IGH) of R&D scientists, viz., physicists, chemists and mathematicians. An effort has been made to examine the factors which may have some bearing on IGH. The results are based on a survey of 75 scientists working in three different laboratories of Delhi.

INTRODUCTION

With increasing complexity in modern social, economic, environmental and defence systems, there has been an exponential growth in the rate of publication of research papers and other types of primary literature. Therefore, it is not possible for a research worker to go through all the literature relevant to his specialization. In view of this and to provide appropriate information service, it is of great importance to study Information gathering habits (IGH) of scientists working in different disciplines. Various studies regarding user's survey and IGH of scientists carried out in U.S.A. and U.K. include Fussler [1],Herner [2], Flowers [3], Chen [8] and Wood [7]. All these studies [1,2,3,8] were meant to find out the use of research literature in the fields of chemistry and physics. These studies mainly concentrated on principal forms of the literature used, important periodical titles and time spent in information gathering etc. by the scientists. Wood [7] has reported about the use of scientific and technical news journals by chemists mainly covering the use of *Chemical & Engineering News.* Chen [5] has also made a study regarding the use pattern of physics journals in large research libraries. Strain [6] has reported about the use of the library by engineers and their views about the loan period etc. In India, Bhushan [4] has made a study of post-graduate students of IIT, Delhi and sought their opinion regarding various services, adequacy of collection, assistance required in the location of the material, time spent in the library and use of catalogue, etc. The analysis in these studies are based on simple percentages, averages, and histograms.

OBJECTIVE

In the studies cited above, the factors which influence IGH of scientists have not been considered in an explicit manner. Nevertheless, there may exist some influential factors which affect a system working under stochastic environment. It is desirable to look into the factors which have a definite relationship with IGH of scientists. As such, the present study is an attempt in this direction. The present study has the following objectives.

a) To estimate the parameters which describe/depict IGH of scientists such as the type of information required, method of its collection, type of publications used, number of journals read, time devoted in information gathering and the use of library and librarian for information needs.

b) To investigate the factors influencing IGH of scientists. More elaborately, to examine the relationship, if any, between the specialization, qualification and the rank of a scientist with the time devoted and the number of journals read.

METHOD OF STUDY

To meet the above objectives, a survey of 150 scientists working in three different research and development laboratories was carried out. The sampling frame consists of physicists, chemists and mathematicians. The scientists chosen at random were asked to fill up a questionnaire. The filled-in questionnaires from scientists were collected personally on different days. There was only 50% success in getting back the filled-in questionnaires. The questionnaire (Appendix A) consists of questions divided into three categories.

a) *Personal Data* : It contains information regarding qualifications, field of specialization, place of work and membership of learned societies.

b) *Information Gathering Habits* : In this part, questions related to the type of information required, method of obtaining the information, type of publications usually consulted, periodicals read, and the time devoted in consulting relevant literature or on information gathering.

c) *Use of Library and Librarian* : This part has questions regarding the use of the library and librarian for the required information and success in obtaining the information.

ANALYSIS OF RESULTS

For the purpose of analysis, various percentages are computed and χ^2 - test* has been applied to examine the effect of influence factors on IGH. The findings are presented below.

a. Personal Data

Out of 75 scientists, who returned the questionnaires, 61% were physicists, 14% were chemists and 24% were mathematicians. By qualifications, 62% have their Ph.D. degrees in different disciplines and 38% were M.Sc's (Table 1). As far as the membership of learned societies is concerned, only 33% of the scientists are members of learned societies. The percentage of chemists holding membership in learned societies, is very high in comparison to mathematicians and physicists (Table 2).

b. Information Gathering Habits

i) Type of Information Required

It has been observed that most of the scientists gather information keeping in mind various objectives, e.g. information for writing a review article, information for the preparation of proposal for a new project, or information for the design/development of some procedure for an experiment. The survey reveals that 85% of the scientists are gathering information on areas related to design/development of some procedure while 61% are gathering information for writing a review article and only 49% are gathering information for the preparation of proposal for a new project (Table 3).

ii) Preference to Information Gathering Method

The information required by a scientist may be obtained by scanning scientific literature or discussion with his colleagues. It is found that 69% of the scientists are gathering information by scanning scientific literature (Table 4).

Table 1 : Specialization and qualification of scientists

Specialization	Qualification			Percentage by Specialization
	Ph.D.	M.Sc.	Total	
Physics	27	19	46	61.33
Chemistry	10	1	11	14.66
Mathematics	10	8	18	24.00
Total	47	28	75	
Percentage by Qualification	62.66	37.33	100	100

Table 2 : Specialization of Scientists and Membership to Societies

Specialization	Total Number of Scientist	Number of Scientists holding Membership	Percentage
Physics	46	16	34.78
Chemistry	11	6	54.54
Mathematics	18	3	16.66
Total	75	25	33.33

Table 3 : Type of Information Required

Type of Information	Specialization				Percentage of the total
	Physicists	Chemists	Mathematicians	Total	
Procedural Infomation	45	11	8	64	85.33
Information for preparing proposal for a new project	20	8	9	37	49.33
Information for writing review article	28	5	13	46	61.33

Table 4 : Preference to Information Gathering Method

Mode of Information Gathering	Specialization				Percentage of the total
	Physicists	Chemists	Mathematicians	Total	
By Scanning Scientific Literature	30	9	13	52	69.33
By discussion with colleagues	5	1	3	9	12.01
Both	11	1	2	14	18.66
Total	46	11	18	75	

This has been further confirmed by a study made by Shiva & Bandyopadhyay [9] in the context of Indian physicists. 12% of the scientists obtain information by discussion with their colleagues.

iii) Sources for Information Gathering

The survey indicates that among all disciplines, periodicals are widely used sources for information gathering (Table 5). This has been

Table 5 : Sources of Information Gathering

Type of Publication used	Number of Scientists
Periodicals	75
Conference Proceedings	65
Advance Research Books	59
Reports	40
Reviews	36

Table 6 : Average Time Devoted in Information Gathering

Time devoted in Hrs	Number of Scientists f	x	fx
1-7	42	4	168
8-14	33	11	363
Total	75	-	531

$$\text{Average} = \frac{\Sigma fx}{\Sigma f} = 531/75 \cong 7.00$$

Table 7 : Especialization of a Scientist and Time Devoted in Information Gathering

Specialization	Time devoted in Hrs 1-7	8-14	Total Number of Scientists
Physics	26	20	46
Chemistry	6	5	11
Mathematics	10	8	18
Total	42	33	75

Observed value of χ^2 = .0157

Tabulated value of χ^2

2, .05 = 5.99

substantiated by studies of Chen [8], Flowers [3], and Herner [2]. Conference proceedings, advanced research monographs, reports, reviews etc. come next to periodicals. None of the groups consider encyclopedias, theses, standards and patents as important sources of primary information. However, these are consulted as and when needed.

iv) Time Spent in Information Gathering

It is probably not true that scientists spend most of their time on laboratory activities. They also spend time on information gathering. Both type of communications: scientific and non-scientific are obtained by the scientists. The survey indicates that on an average a scientist spends seven hours per week i.e. about one sixth of his working time on information gathering (Table 6). A large proportion of this time is spent in scanning or reading current literature.

To meet the objective at 'b', i.e. to find, whether any relationship exists between the specialization, qualification and rank of a scientist with the time spent on information gathering, χ^2 - test has been applied. It is found that observed value of χ^2 is less than the tabulated value in all the three cases (Tables 7, 8, 9) and hence it has been proved that no relationship between the time spent by a scientist on information gathering with specialization, quali-

Table 8 : Qualification of a Scientist and Time Devoted in Information Gathering

Qualification	Time devoted in Hrs 1-7	 8-14	Total Number of Scientists
Ph.D.	28	19	47
M.Sc.	14	14	28
Total	42	33	75

Observed value of $\chi^2 = .6256$

Tabulated value of $\chi^2 = 1,.05=3.85$

Table 9 : Rank of a Scientist and Time Devoted in Information Gathering

Rank	Time devoted in Hrs 1-7	 8-14	Total Number of Scientists
Junior Scientists	16	14	30
Senior Scientists	12	9	21
Top Ranking Scientists	14	10	24
Total	42	33	75

Observed value of $\chi^2 = .1504$

Tabulated value of χ^2 $2,.05=5.99$

Table 10 : Average Number of Periodicals Scanned by Scientists

Number of Periodicals Scanned	Number of Scientist f	x	fx
1-7	57	4	228
8-14	18	11	198
Total	75	-	425

Average $= \Sigma fx/\Sigma f$

$= \frac{426}{75} = 5.68 \cong 6.00$

fication and rank of a scientist has been accepted. More elaborately, we can say that these characteristics, viz., specialization, qualification and rank of a scientist have no influence or impact on the time devoted by him on information gathering.

v) Scanning of Literature

a) Primary Periodicals

The survey indicates that a scientist, on an average scans 6 periodicals (Table 10). A few scientists scan less than 5 periodicals while some scan even 14 periodicals. The periodicals regularly scanned by a scientist include 4 to 6 specialized journals. In addition, every scientist consults one of the science news journals, such as, Nature, Science, New Scientist or a popular journal, viz., Scientific American, Science Today or Science Reporter. Mathematicians generally do not consult the news or popular science periodicals.

Further, to examine relationship between specialization, qualification and rank of a scientist with the number of journals scanned, use of χ^2 - test has been made. It is found that observed value of χ^2 is more than the tabulated value of χ^2 in the case of specialization. Thus, we can say that there exists a definite relationship between the number of journals read and the specialization of a scientist. It is found that chemists and mathematicians on an

Table 11 : Specialization of a Scientist and Scanning of Periodicals

Specialization	Number of Periodical Scanned 1-7	8-14	Total	
Physics	40	6	46	Observed value of χ^2 = 7.9906
Chemistry	6	5	11	Tabulated value of χ^2 2,.05 = 5.99
Mathematics	11	7	18	
Total	57	18	75	

Table 12 : Proportion of Scientists Who Read more than 7 Journals

Specialization	Proportion
Physics	.1304
Chemistry	.4545
Mathematics	.3888

average scan more number of periodicals than the physicists (Table 11,12). The observed value of χ^2 is less than the tabulated value in the case of qualification and rank of a scientist and it has been proved that no relationship between the number of journals read with qualification and rank of a scientist holds good (Table 13, 14).

Appendix B shows some of the journals in physics, chemistry and mathematics which are used most. The maximum use of such journals, as *Journal of Applied Physics, Applied Physics Letters* and *A.I.A.A. Journal* reveals the fact that most of the scientists are gathering information for design/development projects as these journals are devoted to applied sciences. It may be pointed out that *Physical Review* is not a top ranking journal in Physics. It is

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*χ^2 - *test is a statistical test criterion based on χ^2 - distribution, for details see Seigel, S. Nonparametric statistics for the Behavioral Sciences, 1956, Mc-Graw Hill Book Co.*

Table 13 : Qualifications of Scientists and Scanning of Periodicals

Qualification	*Number of Periodicals Scanned* 1-7	8-14	Total	
Ph.D.	37	10	47	Observed value of χ^2 = .5117
M.Sc.	20	8	28	Tabulated value of χ^2 = 3
Total	57	18	75	1, .05

Table 14 : Rank of a Scientist and Scanning of Periodicals

Rank	Number of Periodical Scanned 1-7	8-14	Total	
Junior Scientists	22	8	30	Observed value of χ^2 = .4122
Senior Scientists	17	4	21	Tabulated value of χ^2 2,.05 = 5.99
Top Ranking Scientists	18	6	24	
Total	57	18	75	

probably due to the fact that *Physical Review* has since been split into four parts, i.e., General, Solid State, Nuclear Physics, and Particle & Fields.

b) Secondary Periodicals

The survey indicates that abstracting and indexing periodicals along with other current awareness periodicals are widely used by scientists to obtain specific information and to keep their knowledge uptodate. Appendix C shows the importance of *Physics Abstracts*, *Electrical and Electronic Abstracts* and *Solid State Abstracts* for the physicists and *Chemical Abstracts* for the chemists. From the survey, it has been found that some of the physicists also use *Chemical Abstracts*. The other current awareness periodicals and abstracting and indexing periodicals used by the scientists include *Current Contents : Chemicals and Physical Sciences, Current Papers in Physics, Current Papers in Electrical and Electronic Engineering, Mathematical Reviews, Engineering Index, International Aerospace Abstracts,* and *Statistical Theory and Method Abstracts.*

c) Foreign Periodicals vs. Indian Periodicals

The survey indicates that the periodicals published from U.S.A. have larger readership as compared to other countries (Table 15). The journals, next in the order of readership are from U.K., Switzerland, India, Netherlands, Japan, Germany, Denmark, France, Canada, and U.S.S.R. It seems that periodicals published from Japan, Germany, France and U.S.S.R. have a limited readership because of the language problem. Periodicals published by societies are more popular in comparison to those published by commercial publishers. American Institute of Physics is the leading publisher which contributes the maximum number of journals towards readership in physics while Pergamon Press leads among the commercial publishers. American Chemical Society is the leading publishers which contributes most of the journals towards readership in chemistry. No such distinction is visible for mathematics journals.

d) Use of Library and Librarian for Information Needs

The survey indicates that 80% of the scientists visit their libraries more than 4 times a month but other libraries are visited rarely by them

Table 15 : Number of Journals from Different Countries

Country	No. of Journals
U.S.A.	77
U.K.	18
Switzerland	6
Netherlands	5
India	5
Japan	3
Germany	2
Denmark	2
France	1
Canada	1
U.S.S.R.	1

Table 16 : Use of Library

	Number of times per month	Number of Scientists	Percentage of Scientists
Own Library	Four times	15	20
	More than four times	60	80
Other Library	Once	60	80
	Twice	15	20

Table 17 : Success of Getting Information in the Library

	Chance of getting information	Number of Scientists	Percentage
Own Library	Mostly	65	86.66
	Seldom	10	13.33
Other Library	Mostly	65	86.66
	Seldom	10	13.33

Table 18 : Use of Librarian for Information Needs

Chance of Consulting the Librarian	Number of Scientists	Percentage
Mostly	25	33.33
Seldom	50	66.66

Table 19 : Success in Getting Information through Librarian

Chance of Getting Information	Number of Scientists	Percentage
Mostly	45	60
Seldom	30	40

(Table 16). Similar results have been reported by Chen [8]. This happens because scientists normally find information of their requirement in their own libraries.

The scientists were asked - how often they consulted the librarian for their information needs and how successful were they in getting the information. The survey reveals that scientists usually do not consult the librarian for their information needs. However, they do consult them for the location of the literature. Further, it has been observed that they get the required information as and when they consult the librarian (Table 17, 18, 19).

CONCLUSION

From the survey, it has been found that most of the scientists collected information keeping more than one objective in view, viz., information for writing a review article,preparing proposal for a new project or procedural information for design/development work. Nevertheless, it is observed that most of the scientists collect procedural information for the design/development projects. Periodicals are the highly used sources of information gathering and the average number of primary periodicals scanned by a scientist is 6. This also includes popular and news periodicals. The number of periodicals scanned are independent of the qualification and rank of the scientist. However, a definite relationship has been observed in the number of journals scanned by a scientist and his specialization. It has been found that chemists and mathematicians, on an average scan more number of periodicals than physicists. Further, periodicals published from U.S.A. and by various international societies have a larger readership. The scientists also make use of secondary information services e.g. abstracting and indexing periodicals and current awareness services. The time spent by the scientists in gathering information on an average per week is 7 hours. It may be worthwhile to point out that specialization, qualification and rank of the scientist has no bearing on the time spent in information gathering. The scientists use their own libraries mostly for information gathering, however, they do visit other libraries occasionally.

As is usual with human surveys, authors also experienced problems in getting information (on questionnaires) from scientists because of their busy schedule or normal reluctance.

The investigations in the present study are based on a small sample. However, when one is posed with the problem of redesigning information services, selection of periodicals, reallocation of resources at an information centre, it may be desirable to carry out analysis on a larger scale. As such, the present survey may serve as a guide for future studies.

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Appendix A

INFORMATION GATHERING HABITS OF R&D SCIENTISTS

PERSONAL DATA

(a) Degrees earned . . . .

(b) Mark your major field of academic qualification.

Chemistry . . . .

Physics . . . .

Mathematics/Statistics/Operational Research . . . .

. . . .

(c) Name of the Organization . . . .

(d) Are you a member of a learned society . . . .
Yes/No

INFORMATION GATHERING HABITS

(a) Mark the type of information often required by you.

Procedural information . . . .

Information for writing a review article . . . .

Information for preparing the proposal for a new project . . . .

(b) Mark, how did you obtain the required information?

Through conversation with individual scientists/ By scanning scientific literature/both.

(c) Mark the type of publications you often consult for your work.

Periodicals . . . .

Review publications ....

Reports ....

Conference proceedings ....

Handbooks and tables ....

Encyclopedias ....

Patents ....

Standards ....

Others ....

(d) Name the periodicals you usually consult for your work.

(1) ....

(2) ....

(3) ....

(4) ....

(5) ....

(6) ....

(7) ....

(8) ....

(9) ....

(10) ....

(e) Name the abstracting/indexing periodical you usually scan for your work.

(1) ....

(2) ....

(3) ....

(4) ....

(5) ....

(f) Mark the time devoted by you in reading relevant literature per week.

1-7 hours/8-14 hours.

USE OF LIBRARY AND LIBRARIAN

(a) Mark how often you consult your own library in a month?

Four times/More than four times.

(b) Mark how often you consult other libraries in a month?

Once/Twice

(c) Mark how successful are you in getting information in your own library?

Mostly/Seldom

(d) Mark how successful are you in getting information in other library?

Mostly/Seldom

(e) Mark how often you consult a librarian for your information needs?

Mostly/Seldom

(f) Mark how successful are you in getting your information through librarian?

Mostly/Seldom

Appendix B

JOURNALS CONSIDERED IMPORTANT BY THE SCIENTISTS

Physicists

1. Journal of Applied Physics
2. Thin Solid Films
3. Applied Physics Letters
4. Applied Optics
5. Physical Review
6. Solid State Electronics
7. Physica Status Solidi
8. Proceedings of IEEE
9. Journal of Physics
10. Laser Focus
11. Review of Scientific Instruments
12. Solid State Technology

Chemists

1. Journal of Electro-Analytical Chemistry
2. Journal of Crystal Growth
3. Journal of Material Science
4. Journal of American Chemical Society
5. Journal of Organic Chemistry
6. Journal of Polymer Science
7. Marko-molecular Chemie

Mathematicians

1. AIAA Journal
2. Operations Research
3. Journal of Space Crafts and Rockets
4. Astronautics
5. IEEE Trans. on Reliability
6. Microelectronics & Reliability

Appendix C

USE OF SECONDARY PERIODICALS

Name of the Periodicals	Numer of Scientists
Physics Abstracts	28
Chemical Abstracts	16
Solid State Abstracts	7
Applied Mechanics Review	7
Electrical & Electronics Abstracts	6

Annals of Library Science and Documentation 1984, 31(1-2), 74-75

SHORT COMMUNICATION

GeoRef - PASCAL - GEODE: CROSS - NATIONAL GEOLOGICAL DATABASE

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Trainee 1980-82
INSDOC, New Delhi-110067

INTRODUCTION

The technological development in terms of extended computer storage facility, improved telecommunication network and reprographic techniques makes it easier to consider and implement worldwide cooperation in building bibliographic databases. We saw two successful databases INIS and AGRIS produced by international cooperation which have long-term implications.

JOINT DATABASE IN GEOLOGY

In the field of geoscience, several cooperative projects have been undertaken in the last decade under the auspices of the International Union of Geological Sciences (IUGS). Three giant databases with worldwide coverage of geoscience literature have come to an agreement in 1981 to form a common database. The American Geological Institute's (AGI) GeoRef; Centre National de la Researche Scientifique (CNRS)'s PASCAL and Bureau du Researches Geologiques et Minires (BRGM)'s GEODE both of France are to develop a joint geoscience database.

The novel feature of this cooperative venture is that the existing databases, viz., AGI's GeoRef, CNRS's PASCAL (Geology sections) and BRGM's GEODE will continue but each will contain all references in the joint database. The printed secondary services now produced from the individual databases will be produced from the joint database; that is, AGI will continue to bring out the Bibliography and Index of Geology and similarly CNRS - BRGM will continue to publish Bulletin Signaletique.

PRINCIPLES OF COOPERATION

The guiding principles towards cooperation are:

a) To exchange data in computer-readable form — Records transferred between the system will be in the exchange format specified in the Reference Manual for Machine Readable Bibliographic Description of ICSU-AB/UNISIST.

b) To establish common indexing vocabulary — Databases are now using their own system thesaurus. In developing a new one, changes have been kept at a minimum and are compatible with the existing thesaurus being used by the individual systems. Through discussion and collobration during 1970-79, a multilingual geological thesaurus was developed with the cooperation of ICSU-AB, IUGS, GeoRef, PASCAL and GEODE.

c) To minimize the changes to exchanged data, the field of geoscience is divided into 29 broad subject headings in GeoRef and in PASCAL-GEODE into 18 themes with 36 subthemes. So the definition and compatibility of the content of the groups of the systems were ensured and computer will be used to eliminate differences among the systems.

To overcome the problem of comprehensive worldwide coverage of literature and to eliminate wateful duplication, a master list of serials has been produced and a method of handling books, conference proceedings, reports, theses and maps has been evolved. AGI will provide references for North American literature, while

CNRS-BRGM will cover European literature. Czechoslovakia, Finland, Hungary, Poland, Romania, Spain and West Germany will provide literature from their own countries. Other areas are divided among the systems to ensure global coverage. The agreement also keeps provision for participation of other countries.

CONCLUSION

This cooperation to develop a joint geoscience database is a landmark in the integration of national and international databases of a subject area. The very concept of GeoRef - PASCAL - GEODE cooperation is unique. The individual system will maintain its identity and commercial interest overcoming the problem of comprehensive coverage, increasing cost and duplication. This new cooperation concept will have a great impact on future cooperative projects of databases.

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